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ABSTRACT

In this project, five alternative methods of forecasting labor supply and demand in an urban labor market were compared in order to determine the optimal method for supplying labor market information to public vocational education systems. The Milwaukee, Wisconsin SMSA was chosen as the site of the project. The project determined the extent to which information provided by state employment services meets the goals of the Vocational Education Act of 1963. The study found that curriculum planning can be served best by current employment estimates and short-run projections for specific occupations. Although none of the five methods was found to be fully satisfactory, the report recommends the use of a modified Area Skill Survey technique, possibly combined with certain aspects of other techniques for particular situations. The appendixes constitute a major part of the report, incorporating substantial back-up material for the five methods appraised. (BH)

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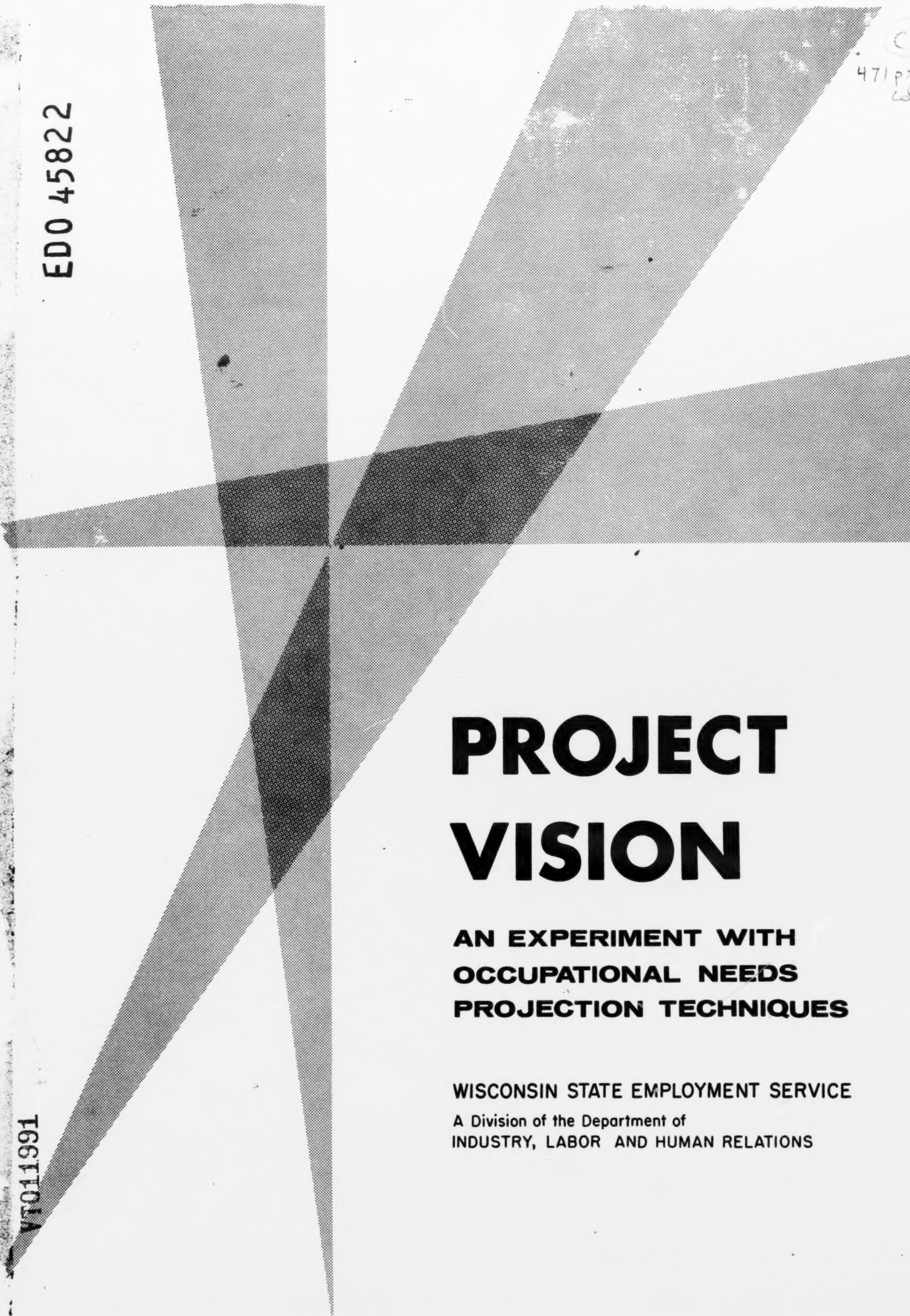

# PROJECT VISION

## AN EXPERIMENT WITH OCCUPATIONAL NEEDS PROJECTION TECHNIQUES

WISCONSIN STATE EMPLOYMENT SERVICE
A Division of the Department of
INDUSTRY, LABOR AND HUMAN RELATIONS

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# PROJECT VISION

## (Vocational Information System Involving Occupational Needs)

An Experiment With Occupational Needs Projection
Techniques for Vocational Education Curriculum
Planning Purposes

in the

MILWAUKEE, WISCONSIN SMSA

Prepared under the General Direction of
William R. Fischer, Director
of
Program Development and Research

U.S. DEPARTMENT OF HEALTH, EDUCATION
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WISCONSIN STATE EMPLOYMENT SERVICE
A Division of the Wisconsin Department
of Industry, Labor and Human Relations
June 1970

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The PROJECT VISION study was conducted under a research contract with the Manpower Administration, U.S. Department of Labor. However, the Wisconsin State Employment Service is solely responsible for the conclusions in the report and for the factual accuracy of the material presented. Much of the data in the report, and the approaches utilized to develop them, are experimental in nature. It is hoped that these experiments will be helpful in evaluating existing approaches and developing improved methods and procedures for providing sound labor market and manpower information to use as a basis for vocational education curriculum and other planning.

Staff involved in the project, under the general direction of William R. Fischer, Director of Program Development and Research for the Wisconsin State Employment Service, included Thomas Ritter, Project Supervisor; Principal Investigators John Bischel, Kenneth Cole, James J. Hoppenjan, Norman Huth, and Harvey Sokolow. Kay Elwers made valuable contributions in the area of analysis and final editing.

Many persons in the Manpower Administration contributed materially to PROJECT VISION. The continuing support throughout of Howard Rosen, Director, Office of Research and Development, Office of Policy, Evaluation and Research (OPER), and Vladimir D. Chavrid, Assistant Director for Technical Development and Analysis, Office of Technical Support, U.S. Training and Employment Service (USTES), is most appreciated. Special acknowledgements are due Harold Kuptzin, Chief of the Division of Job Market Analysis, USTES, Joseph B. Epstein, Chief, Economic Development Group, Division of Research Methods and Services, OPER, and Lester Rindler of the same Group, for their work in connection with the initial conception and design of the project, the development of the outline of the final report for the presentation of the study findings, and their comments and suggestions in the review of the report manuscript.

Norman Medvin, Assistant Chief of the Division of Manpower Matching Systems, USTES, assisted in the experiment relating to the use of Employment Service unfilled openings as a means of projecting occupational requirements for vocational education planning. The chapter related to the testing of the Occupation-by-Industry Matrix technique drew on the work of the U.S. Bureau of Labor Statistics and that of Professor William Himmelbauer of the University of Chicago Graduate School of Business, as well as on Manpower Administration activities in this field.

PROJECT VISION was also greatly aided by the advice and editorial assistance of two consultants, Gerald G. Somers, Chairman, Department of Economics, University of Wisconsin, Madison, and Earl M. Stephanson, Associate Professor of Economics, Wright State College, Dayton, Ohio, formerly Regional Economist in the Chicago Regional Office, USTES.

The final editing of the report for publication was done by John Fletcher Wellemeyer and Janet L. Smith of J. F. Wellemeyer and Associates, Economic Consultants, Washington, D. C.

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# CHAPTER I

# EVALUATIONS AND ACCOMPLISHMENTS AND RECOMMENDATIONS

PROJECT VISION's efforts were directed in the first instance toward the critical review of five alternative methods of forecasting labor supply and demand in an urban labor market area. It was one of a number of studies financed by the U.S. Department of Labor in the late 1960's to perform experimental research on how best to meet the requirements of the Vocational Education Act of 1963.[1] This act requires Employment Services in the States to supply labor market information to public vocational education systems so that training programs may be designed and administered more effectively. This idea was not new. The U.S. Bureau of Employment Security initiated work on this subject in the mid-fifties and concern about the matter had begun before then.

The Wisconsin State Employment Service agreed to undertake PROJECT VISION under a research contract funded by the Manpower Administration of the U.S. Department of Labor. The field work took place during 1967 and 1968 in the Milwaukee Standard Metropolitan Statistical Area. "VISION" is the code name for Vocational Information System Involving Occupational Needs.

The five alternative methods or approaches examined closely were the Experimental Employer Needs Survey (a variant of the Area Skill Survey technique); the Leading Indicators Experiment approach; the Industry Expert approach; the Unfilled Openings-Occupational Outlook Handbook approach; and the BLS Occupation-by-Industry Matrix Technique, Method A. Of these approaches, the one most commonly in use at the time PROJECT VISION was initiated was the Area Skill Survey technique. It was developed by the national office of the Bureau of Employment Security (now part of the Manpower Administration of the U.S. Department of Labor) in the midfifties and introduced into the Employment Service administrative programs in various States. The method basically relies on occupational demand forecasts for three and five years hence made by representative employers in selected industry groups. In practice, variations are introduced into the standard or model version in order to adapt it to unique situations or in an effort to arrive at more realistic and therefore more practical results for use by the ultimate consumers. PROJECT VISION's Experimental Employer Needs Survey is one such variant. Those who can be expected to find it of interest will include, as in the past, business establishments, labor representatives, students, government officials, as well as persons immediately concerned with manpower problems.

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[1] U.S. Congress, Vocational Education Act of 1963, Public Law 210, 88th Cong., 1963. (Referred to throughout as "Vocational Education Act of 1963.")

This publication is a report on all phases of the work that went into testing the adequacy of each of these techniques to provide a labor market information system that could effectively aid State and local education officials in the programming of curricula to meet the labor force needs of area employers. Consideration was also given to the conditions under which, in terms of available qualified personnel and potential costs, manpower surveys using a selection of the techniques studied might be effectively incorporated into local labor market area programs for the continuing provision of manpower needs information.

The objectives, scope, and limitations of the overall project are detailed in Chapter II. Since the Milwaukee SMSA was chosen as the site of the project, its manpower setting at the time of the field work is described in Chapter III. Chapters IV through IX cover the development and application of various experimental labor market information techniques with respect to aspects of labor requirements, including projections of demand for workers in specific occupations. Chapters X and XI deal with labor supply questions, while Chapters XII and XIII discuss vocational educators' information needs and the problems connected with communication, in occupational terms, between Employment Service and vocational education personnel.

The appendixes constitute a major part of this report. Generally speaking, they incorporate substantial back-up material related to each of the five methods appraised, including procedures, instructions, forms and worksheets. For the most part, PROJECT VISION did not attempt to compile concise statistical results for specific use by vocational educators in planning their curriculum programs. However, selected compilations are presented for the Experimental Employer Needs Survey (App. A), the Unfilled Openings-Occupational Outlook Handbook approach (App. I), and the BLS Occupation-by-Industry Matrix technique (App. F). Also included is an example of the application of the experimental "job clustering" system (a cross-classification which relates occupations to educational subject matter) in which HEW instructional program titles are converted to specific vocational courses at the Milwaukee Technical College (App. J).

There is reason to believe that some phases of the results have already served as benchmarks for further efforts toward developing badly needed means of communication with respect to occupational needs between employers and those responsible for vocational training. It is hoped that some of the other findings will also prove useful in advancing the general purposes of the 1963 Act as well as their further refinements as passed by Congress in the Vocational Education Amendments of 1968.[2]

## EVALUATIONS

PROJECT VISION attempted to determine whether and to what degree the end purposes of the Vocational Education Act of 1963 can be expected to be served by State Employment Services through employment research and the provision of information with respect to occupational needs to State and local education officials. Therefore, this evaluation of its findings is made in the light of the provisions of the act itself.

The 1968 Amendments to the 1963 Act elaborate on the end and purposes expressed in the original act. As the goals for the Commissioner of Education in cooperation with State public Employment Office systems are stated in the amendments, they look toward the offices of the Employment Office systems

> making available to the State board and local educational agencies occupational information regarding reasonable prospects of employment in the community and elsewhere, and toward consideration of such information by such board and agencies in providing vocational guidance and counseling to students and prospective students and in determining the occupations for which persons are to be trained; and looking toward guidance and counseling personnel of the State board and local educational agencies making available to public employment offices information regarding the occupational qualifications of persons

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[2] U.S. Congress, Vocational Education Amendments of 1968, Public Law 576, 90th Cong., 1968. (Referred to throughout as "Vocational Education Amendments of 1968.")

> leaving or completing vocational education courses or schools, and toward consideration of such information by such offices in the occupational guidance and placement of such persons.[3]

It is most important to realize that the concern of Congress in this regard was that "persons of all ages in all communities of the State . . . will have ready access to vocational training or retraining which is of high quality, *which is realistic in the light of actual or anticipated opportunities for gainful employment*, and which is suited to their needs, interests, and ability to benefit from such training."[4] (Italics PROJECT VISION's)

Thus, the stipulations of the 1963 Act and its amendments set exceedingly high standards of performance for both the vocational education and public Employment Service administrators. It is against these standards that PROJECT VISION's judgments are made and recommendations offered. If PROJECT VISION's comments seem critical at times, and its aspirations for the future of the cooperative venture a little idealistic, it is because its staff of trained research personnel, having considerable public Employment Office experience, believed a frank appraisal to be the soundest approach to achieving the progress that must be made if "persons of all ages in all communities of the State" are to benefit from the provisions of the act that are relevant to sound vocational guidance and good job placement.

PROJECT VISION, on the basis of the Milwaukee experience, gained the impression that curriculum planning by vocational education administrators for a labor market area can be most effectively served if it is based on reliable estimates of current employment in specific occupations accompanied by short-term (one or two year) projections of employment opportunities. As a general rule the occupations for which information was said to be needed are those at the entry level of industrial and business establishments. PROJECT VISION suggests that this occupational skill limitation on the part of the vocational education administrators does not sufficiently take into account the role of assisting in the upgrading of employed workers that public vocational education is expected to play under the 1963 Act.[5] At the time the project was initiated, training for the purposes of upgrading was found in almost every instance in the Milwaukee area to be the responsibility of industry itself by means of its management of what may be called its "internal labor market."

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[3] *Ibid*., Part B, sec. 123(a)(8).

[4] Vocational Education Act of 1963, Part A, sec. 1.

[5] *Ibid*., Part A, sec. 4(a)(3).

The Vocational Education Amendments of 1968 also stipulate that any Federal funding at the State level must be based in part on the demonstration that State and local vocational education programs have taken into account "projected manpower needs and job opportunities, particularly new and emerging needs and opportunities on the local, State and national levels."[6] If PROJECT VISION found a representative situation in the Milwaukee area, new ground had to be broken at the local Employment Service level in order to develop appropriate procedures designed to identify the individual occupations evolving at a given point in time. However, during the period in which PROJECT VISION was in progress, advances were made in the initiation of such procedures to which the PROJECT findings contributed.

In view of the expressed and probably an expanding need for area-wide indicators of specific future occupational requirements, PROJECT VISION came to the conclusion that no one of the five projection techniques tested in Milwaukee can fully satisfy the conditions as stated. The nationally developed U.S. Training and Employment Service Area Skill Survey technique, modified and used by PROJECT VISION as the Experimental Employer Needs Survey technique, can provide the current employment statistics needed, but is less reliable in projecting employers' future occupational requirements on overly long forecast periods of three and five years. Not only did the length of the time periods on which the projections were based appear to be unrealistic for vocational education planning purposes, but it was found to be almost impossible for employers to provide the requested estimates with any degree of reliability. Also, the Experimental Employer Needs Survey as constructed at that time proved to be an unsatisfactory vehicle for identifying "emerging" occupations.

The other techniques tested in Milwaukee as part of this project appeared to offer no better overall solution to the need for short-term quantitative projections for an across-the-board occupational matrix. However, the technique used by the study of the Metal Casting industry, an in-depth industry analysis, does hold promise of providing excellent qualitative judgments as to the need for graduates of specialized occupational training courses. Likewise, a useful guide to future demand in certain occupations was found in the Unfilled Openings-Occupational Outlook Handbook technique. This method provides a valuable delineation of hard-to-fill job openings registered with the local public Employment Service but its usefulness is restricted by the fact that the placement penetration of the service varies from industry to industry in any given labor market area.

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[6] Vocational Education Amendments of 1968, Part B, sec.123(a)(6)(A).

PROJECT VISION suggests that precise occupational needs projections can result from employing the Occupation-by-Industry Matrix, Method A technique. However, there is a reluctance to recommend that it be used in most local labor market areas. In the development stage tested by PROJECT VISION, there is reason to believe that it could be applied appropriately only at the State level or in the very largest standard metropolitan statistical areas.

On the basis of in-depth analyses of all five methods tested by PROJECT VISION, it would appear that the occupational information needs of the vocational education system probably can best be served by a simplified and modified Area Skill Survey technique. The most important steps to be taken to develop such a model technique would include programming it on a frequent, recurring schedule; shortening the occupational requirement forecast period; and sharpening the occupational and employment language tools used by the Employment Service, industry, and educators. There would always be an important place for certain aspects of the other techniques, the use of which would be dependent on the industrial character of any particular labor market area and the availability of research facilities.

Estimates of the overall supply of workers available and anticipated to meet industry's labor requirements both current and for the years ahead are one of the factors needed to evaluate the adequacy of a labor market area's vocational training programs. The components of the supply picture for both inexperienced and experienced workers are many and in a constant state of flux. PROJECT VISION did little more than make exploratory efforts to determine possible sources of information to which innovative techniques for measuring supply on an area-wide basis could be applied. It recommends the development of an area-wide data-collection system.

Not every State public Employment Office system could easily and quickly take up the responsibilities given it under the Vocational Education Act of 1963. Characteristically, there had been no uniform pattern among the States with regard to support for employment research and information functions. Wide variation has been the rule with respect to the range of problems studied, in the qualification standards for research personnel in local offices and in the amount of money allocated for research purposes.

Generally speaking, there has been an expansion of employment research efforts since the passage of the act, in part because additional States made provisions for funding occupational needs research which must be performed at the local Employment Office level. Such research is performed in some States by local area personnel with assistance from State and regional Employment Service administrators. One of the interests of PROJECT VISION was to evaluate in general terms the occupational information techniques tested from the point of view of staff requirements and costs. Comments in regard to these factors appear throughout the report.

Regardless of the technique used, the cost factor varies in relation to the extent that data are acquired on a one-time survey or special request basis or, alternately, from such information as is available on records normally collected by an agency in the course of carrying out its daily administrative tasks. From this point of view, the Area Skill Survey technique or some modification of it is judged to be the most costly. This is due to the elaborate planning, execution, and analytical phases involved. Even if it were to be greatly simplified in the direction of PROJECT VISION's recommendations, it would still have to be undertaken with special data-collection activities each time it was initiated. In relative terms, the Occupation-by-Industry Matrix technique, Method A can be judged second to the Area Skill Survey, while the Unfilled Openings-Occupational Outlook Handbook approach, because of its reliance almost entirely on Employment Service records, is probably the least expensive. In a category by itself, because of its limited occupational application, the Industry-Expert approach can be said to be a relatively inexpensive method. Its success is largely dependent on the basic information obtained from invaluable interviews with industry representatives.

It is fair to ask if actual expenditures should constitute the only measure of cost. Taking a modified Area Skill Survey technique as an example, since it was judged that the best overall results should probably be derived from it, although it would be costly, it might be desirable to select it because of the prospect of obtaining data more realistic in terms of vocational education objectives than other less expensive approaches might provide. The choice that will be made in any given instance will vary with the circumstances, but in the end it will be a value judgment in terms of the money allocated. The assumption should also be made that as the local office research staff gains proficiency from training and experience, the costs can be lessened to some extent.

Thus, the point is raised regarding the professional qualifications required of a State Employment Service agency research staff to produce quality results from the various techniques. It is reasonable to say that, while its results would benefit from the work of an occupational analyst thoroughly familiar with the industry to be studied, the Industry-Expert approach could be undertaken by someone not especially trained in statistical methods. It is probable that a qualified Employment Service placement officer could transact the basic employer interviews effectively provided he were interested and willing to "bone up" on the industry. The other techniques require, in varying degrees, at least one staff member with a strong statistical background. Occupational and labor market analysts are also needed for these techniques as well as a sufficient number of administrative, technical research, editorial, and clerical personnel. The point is made in one of the recommendations offered by PROJECT VISION that the planning for staff assignments in administrative research units in local offices should permit the research personnel to be free of the clerical aspects of analytical research. This observation can afford to be emphasized as a means of reducing final costs and increasing the value of the end product of any survey.

## ACCOMPLISHMENTS AND RECOMMENDATIONS

In order to orient the reader to PROJECT VISION's comprehensive mission, its accomplishments and findings are summarized in this section by means of a series of concise statements about each of the chapters from Chapter IV onward. Each of these topical synopses is followed by a commentary embodying PROJECT VISION's conclusions and recommendations concerning the chapter's subject of study. Manpower administrators may find these useful in selecting methods of projecting occupational trends.

### CHAPTER IV. THE EXPERIMENTAL EMPLOYER NEEDS SURVEY

> This portion of the PROJECT VISION research undertaking was based on a modification of the BES Area Skill Survey technique. The standard skill survey is conducted by means of a prototype mail questionnaire which asks individual employers to forecast their employee requirements for the subsequent three and five years by specific occupations, taking into account both replacement and expansion needs (or contraction as the case may be). The Experimental Employer Needs Survey was the take-off point for other segments of the project.

The survey's carefully devised sampling of the establishments in the Milwaukee SMSA resulted in the collection of valuable current employment data for a broad spectrum of occupations, particularly those of an interindustry nature. That the Area Skill Survey technique yields data of this caliber in such a large metropolitan area is a measure of its value as a tool in building the labor demand picture. It is suggested that prelisting occupations on the questionnaire schedules proved to be fully satisfactory and that reliance on employers' job titles was unnecessary and, in fact, complicating. The survey's success was aided by the fact that relations with employers, educators, and with the Metropolitan Milwaukee Association of Commerce were friendly and cooperative. The Association joined in the sponsorship of the survey and was very helpful in obtaining the cooperation of respondents. The results of a pretest, in the form of a review of the questionnaire in the preliminary stages by the representatives of many of these organizations and establishments, were of great value to its final construction.

The importance of the finding concerning the acquisition of current employment data can hardly be exaggerated. A reliable base of this nature is indispensable for adequate labor requirement projections for specific occupations whatever the length of the forecast period adopted. In contrast to the Experimental Employer Needs Survey request for 3- and 5-year projections, which employers could rarely make with confidence, there was evidence that a shorter time period of one or two years would be so much more acceptable to employers that immediate results would be seen in an increased rate of response from both large and small firms and in a greater degree of accuracy in the returns. Importantly, a shorter forecast period is also in line with the practical aspects of curriculum programming, a concern that is fully discussed in Chapter XII, Vocational Education Information Needs and System.

PROJECT VISION offers an overall recommendation that the questionnaire as a whole be simplified. As PROJECT VISION developed and conducted the survey, it became too time-consuming and too expensive. In a large firm the time element, of course, converts to money, and gathering complicated data on occupations scattered throughout several shops can be very costly. PROJECT VISION concluded that the information requested was "ideal," but at the same time much of it was impractical to obtain. It was costly to the Employment Service as well. For the same level of expenditure a survey with a less complex format taken every year or two could achieve results that would come closer to accomplishing the mandate given to the Employment Service under the Vocational Education Act of 1963 and the Vocational Education Amendments of 1968.

PROJECT VISION recommends not that the standard Area Skill Survey be abandoned, but that a new approach be developed that would yield data more closely related to the kind of information which vocational educators have expressed need for. Some of the same format would be used but the emphasis would be on occupational trend data in individual plants rather than on projections of labor requirements. Likewise, greater stress would be placed on securing knowledge of employers' preferred sources of entry-level personnel, untrained or trained, and information regarding their own in-plant training programs. A brief outline of such a suggested approach is given at the end of Chapter IV under the title "Area Employment Benchmark Survey -- A New Approach."

The preceding discussion pertains to aspects of the Experimental Employer Needs Survey that are largely under the control of the designers of the survey and are, therefore, subject to study and revision if that should be deemed to be advisable. A more subtle problem was found to lie in the area of labor market and manpower terminology as used by educators, employers, and labor market analysts. It involves not only the understanding and use of technical occupational language as formulated in the Standard Industrial Classification (SIC) and the Dictionary of Occupational Titles (DOT) of the U.S. Department of Labor, but also that of more general terms frequently used in the study of economic and manpower problems. Employers' inadvertent misinterpretation of concepts underlying sections of the mail questionnaire occurred often enough so that the judgment of experienced labor market analysts had to be called on to interpret the results. An outstanding example of such misunderstanding was the employers' frequent use of employee turnover rates in response to a request for an estimate of "replacement needs." Moreover, turnover data for whole shops were often entered rather than for individual occupations as requested since that is how they were usually calculated.

Overall the problem is one of adequately transmitting information from organization to organization in a three-way dialogue. It includes the very important question of how best to interpret the survey results so that vocational education personnel as well as employers find them useful for planning purposes.

# CHAPTER V. OTHER EMPLOYER-BASED APPROACHES

## Two New Methods Based on Responses from Selected Employers

> PROJECT VISION attempted to discover whether the management plans of employers in specially designed samples would provide enough information on technological and occupational trends to offer some direction to vocational training in a labor market area.

The Leading Indicators Experiment approach attempted to identify, from the Experimental Employer Needs Survey returns, the leading firms which might be among the more progressive and whose occupational mix and projected employment trend might provide information useful for vocational education planning. The method involved follow-up interviews with employers who had responded affirmatively to "leading indicator" questions included on the mail skill survey questionnaire. Results were not satisfactory. The findings provided useful insights into the establishments' occupational structure and outlook, but they failed to meet the prime objective of revealing leading firms. PROJECT VISION suggests that a better (and cheaper) sampling base plus improvement in the questionnaire for this purpose might well make the method worth further experimentation.

In contrast to the Leading Indicators Experiment approach, which bases its analysis on responses from selected firms to a mail questionnaire, the Industry-Expert approach secures the desired information by means of interviews with industry experts from a more broadly representative group such as company presidents, plant managers, employment managers, training directors and others. This approach was attempted with the Printing and Publishing industry and with the Metal Casting industry. Industrial identity for Printing and Publishing was established according to the Standard Industrial Classification. It was found that occupational homogeneity could not be achieved because the SIC is based on the product and not on the activity of the firm. For example, although classified together in the SIC code, firms engaged in producing printed containers are often largely involved in paper converting, with occupations having nothing to do with printing and publishing as commonly understood. (PROJECT VISION frequently encountered difficulties with the SIC and makes this point on many occasions.) This experience with the Printing and Publishing industry was valuable, however, in planning the Industry-Expert approach for the Metal Casting industry which was undertaken subsequently.

For this latter industry an innovative modified SIC classification was used and occupational homogeneity was substantially achieved. An occupational matrix for the industry was obtained, turnover rates were calculated, and a comparison of these findings with those of the Unfilled Openings-Occupational Outlook Handbook approach was made for two occupations. The latter showed comparable results. In contrast, comparisons with the Experimental Employer Needs Survey results were made difficult, again because of the intractability of the SIC classification.

PROJECT VISION was enthusiastic about the Metal Casting study. The interviews with industry experts were conducted in a harmonious atmosphere and valuable training needs data as well as indications of emerging occupations were obtained. Although it was not feasible to develop these in quantitative terms, the qualitative occupational trend information secured for occupations within a specialized segment of industry was judged to be eminently worthwhile. If this approach were designed in a less elaborate but still adequate fashion, keeping to the basic premises, overall it could be a relatively inexpensive approach to use and could be accomplished within a short period of time compared to the time involved in using the Area Skill Survey technique. It is recommended that it be explored further with one important proviso. It should only be applied to occupations peculiar to a selected industrial activity; it should not be used in connection with occupations which have a broad industry base.

## CHAPTER VI. EMPLOYER-BASED DATA AS A MEANS OF IDENTIFYING EMERGING OCCUPATIONS

> Emerging occupations are those in which employment at the moment is small or nonexistent, but which may be expected to increase significantly. No special survey was made, but an analysis of the Experimental Employer Needs Survey results and pretest occupational materials was made which yielded a short list of occupations for which training programs might be usefully designed.

The purpose of undertaking to recognize emerging occupations, particularly with reference to planning vocational training programs, is to identify those occupations which are likely to grow rapidly even though the number of workers employed in them currently is not large, and which will necessitate recruiting people from outside a plant who would need to acquire some specialized skill not readily available in the community. The Experimental Employer Needs

Survey did not ask this question directly (although the BES Area Skill Survey Handbook suggests it). However, by analyzing occupations which were not included on the prelist but which were entered on the schedules by employers, and by examining certain other data selected from the skill survey findings, a number of emerging and "possibly emerging" occupations were singled out. Among these were electronic instrument repairman, business machine repairman, and several types of machine operators in plastics establishments. PROJECT VISION found there was reason to question the suitability of the standard Area Skill Survey as a vehicle for identifying emerging occupations. If used for this purpose, it is suggested that the technique requires a careful restructuring of the questionnaire with particular regard to the occupational terminology. Also an extensive follow-up program is recommended.

## CHAPTER VII. THE UNFILLED OPENINGS-OCCUPATIONAL OUTLOOK HANDBOOK APPROACH

> The Unfilled Openings-Occupational Outlook Handbook approach was put forward in an article by Norman Medvin in the Employment Service Review in January 1967. It does not require gathering new original data, but relies on existing material and the expertise of Employment Service personnel in interpreting occupational trends locally in the light of national developments.

This approach uses data available from selected records of the Employment Service agencies such as unfilled openings, in combination with routinely collected information from other Federal and State agencies. Basic to the technique is the application of the Occupational Outlook Handbook forecasts of national trends in specific occupations. Its chief advantages are the economy of data gathering and the ease of repeating the analytical study at frequent intervals. On the other hand, the materials have certain deficiencies (for some occupational areas, the local Employment Service records may contain data which are neither adequate nor representative); and the method has no real predictive devices related to labor demand in selected occupations in a given local area. Further, the data lack meaning for vocational program planning because no provision is made for estimating supply of available workers for selected occupations.

In order to offer a means of overcoming some of the deficiencies, PROJECT VISION's staff constructed a methodology, termed a "gap" study, which was designed to fill in labor requirements for occupations not well covered by local Employment Service records.

In addition, supplementary procedures were developed which could help in the determination of labor availability for hard-to-fill job orders placed with the local Employment Service. A format for the presentation of the results of the application of both procedures may be found in Appendix I.

On the basis of this use-test of the UFO-OOH technique, the method was judged to be useful to manpower planners as one of a number of labor market "indicators" provided certain revisions are incorporated which adapt the data to the local employment situation.

## CHAPTER VIII. OCCUPATION-BY-INDUSTRY MATRIX, METHOD A TECHNIQUE

> This chapter deals with the application of the U.S. Bureau of Labor Statistics matrix to local area industry statistics. A matrix, used in this sense, is a cross-classification of industries by occupations, yielding an occupational pattern for each industry "broken out." The Bureau of Labor Statistics has made projections of the various industries on a national basis to 1975, and has recently proposed methods of applying their technique to States and SMSA's. Chapter VIII recounts the problems of applying the Method A technique to the Milwaukee SMSA.

The application of the BLS Matrix, Method A technique to the employment situation in the Milwaukee SMSA resulted in a number of findings that, it is hoped, will be of value to manpower officials responsible for making and using labor market area occupational needs projections.

An advantage inherent in the technique is that decennial Census data can be used in applying the established BLS methodology. Although the method is constantly being refined, PROJECT VISION in evaluating the results of its test in the Milwaukee area in the light of their usefulness for vocational education curriculum programming concluded that, as designed at that time, the method did not yield sufficiently refined occupational detail. Because of this, and because the method requires the expensive application of data processing to raw figures, the recommendation is made that it should not be applied to SMSA areas smaller than the very largest in the Nation such as New York and Los Angeles. However, this does not preclude the possibility of using it effectively with social and economic data at State and regional levels which do not require the refinement necessary for the development of vocational curriculum design.

In terms of detailed future occupational projections, the method was found to have two statistical limitations. One was that the method as tested by PROJECT VISION made no allowances for employment requirements which normally result from worker-replacement needs arising from deaths, retirements, migration and other causes. The other limitation stemmed from the varying definitions of employment used in the basic data derived from the various sources on which the method depends.

A change in the definition of the geographic area of the Milwaukee SMSA during the period for which the time series were developed was a complicating factor in making the necessary estimates. Although it was possible to make the required adjustments, attention is called to this difficulty because it was probably not a unique situation and does necessitate a good deal of extra work to obtain a uniform series.

It is suggested that the statistical procedures which must be applied to the basic data do not require the expertise of a highly trained mathematical statistician. However, desirable skills among the staff members working with this method include a familiarity with least-square methods and knowledge of the various national, State, and local statistical series involved.

## CHAPTER IX. REPLACEMENT DEMAND INFORMATION

This chapter discusses the importance of Replacement Demand Information, and reviews critically two principal methods of obtaining the information, both of which use basic data secured by means of the Experimental Employer Needs Survey.

In a labor market area as large as the Milwaukee SMSA, there is a substantial labor force requirement derived from industry's need to "replace those workers who will leave the occupation because of promotion, retirement, death, disability, withdrawal for military service." These workers constitute the "replacement demand" in PROJECT VISION's test of the adequacy of alternative techniques designed to estimate their number in the area by occupation as set forth in the BES Area Skill Survey Handbook.

The Bureau of Employment Security developed these techniques, basing them on the Area Skill Survey method. Both are in common use throughout the Nation. In the first, employers are asked in the mail questionnaire to estimate their replacement needs by occupation for the coming year. In the second, employers are asked to furnish on the questionnaire the age and sex of their employees for each occupation, from which information the survey staff subsequently calculates the replacement needs by means of BLS Working Life tables.

PROJECT VISION concluded that estimates resulting from both methods would be less than adequate when measured against the criteria of vocational training administrators' need for reliable base figures on which to program specific curricula. The deficiencies were due in part to the sparse response to this item on the questionnaire, in part to the doubtful accuracy of many of the entries, and in part to certain limitations in the BLS Working Life tables as used in the age/sex technique. Several recommendations are offered which, if adopted, could bring a substantial degree of improvement in the quality of the results from the application of the techniques. A tighter definition of replacement demand would undoubtedly increase the accuracy of the employers' estimates because many of the respondents confused the term with the better known term "turnover rate." "Turnover rate" includes the category "quits" in addition to the sources of replacement demand used in this study. PROJECT VISION suggests that the results of both techniques would benefit from a simplified Area Skill Survey questionnaire. It is believed that it would increase the response rate and improve the quality of the entries because employers could spend more time and effort on such technical items as those needed to estimate replacement needs.

# CHAPTER X. SOURCES OF SUPPLY FOR ENTRY LEVEL OCCUPATIONS

This chapter discusses the sources of supply of data for the number of new inexperienced workers expected to be available to meet future labor requirements. These categories are not only important to employers, but help define the role of the vocational education program within the framework of the overall supply situation.

There are many sources of labor for employers needing workers for entry-level occupations. In order to maximize the flow of this primarily young group of men and women to the job openings in a labor market area, there is need for as much information as possible about their educational and training background. The general composition of the groups within this large category of labor supply are known, namely secondary school dropouts, high school graduates, graduates of apprentice training programs and, importantly, graduates of public and private vocational schools and technical institutes. Unfortunately, however, current practices of information retrieval in the Milwaukee SMSA preclude any overall statement of the relative importance of these supply sources for individual occupations. This in turn, until an area-wide collection system can be instituted, makes it virtually impossible to design a coordinated vocational training program that would be most useful to industry. On the training demand side there is a very real need for a greater understanding of employers' training preferences.

PROJECT VISION, as one of its important undertakings, made an innovative study of labor supply-and-demand relationships in 90 occupations based on forecasts of labor requirements expressed by employers in the Experimental Employer Needs Survey and on an estimated supply of young trainees from various educational sources. The importance of the effort lay not in the numerical results, but in the conversion of data from the disparate sources to a "Common Occupational Language." PROJECT VISION sees an immediate and continuing role for the Employment Service in this badly underdeveloped area of occupational communication.

Believing that more information about the vocational training output from public and private resources is essential in the Milwaukee SMSA, PROJECT VISION recommends that local training institutions jointly consider developing an area-wide data-collection system designed to yield annual figures on the extent of training by curriculum area. It also recommends that some means be devised to transmit to the educators in practical terms the preferences of local industry with respect to entry-level trained personnel.

## CHAPTER XI. SOURCES OF SUPPLY FOR EXPERIENCED WORKERS

> Experienced workers intended for upgrading are already employed, but many other categories of such workers are unemployed. Both groups are in need of varying degrees of specialized training. PROJECT VISION's attempt to identify and quantify these workers for the purpose of vocational training programming were less than successful.

The experienced unemployed may be classified as returning veterans, persons receiving unemployment compensation, women returning to the labor market, and experienced in-migrants. Experienced employed workers include those receiving in-plant training and those changing jobs, possibly involving occupational changes. It is inherently a constantly fluctuating group in size and composition.

PROJECT VISION's efforts to describe in summary form the size and character of these individual groups were constantly frustrated. In some instances the restrictive element was the difficulty of using the available records; in others, it was the lack of precise occupational information for otherwise useful data. Among the sources of information already explored, certain ones warrant further study with a view to arranging for their adaptation to vocational education administrative purposes. These are Veterans Administration files, records kept at the Youth Opportunity Center of the Wisconsin State Employment Service in Milwaukee, future studies of area transportation needs by the Southeastern Wisconsin Regional Planning Commission, and change-of-address cards at the U.S. Post Office.

In the course of this analysis useful additional research which could be undertaken by the Employment Service became apparent. PROJECT VISION recommends that it examine such employment factors affecting the movement of workers within a labor market area as in-plant training policies, lateral job transfers, wage rates, the occupational characteristics of workers who move in and out of the area, and women returning to the labor market. With an occupational orientation, the purpose of such studies would be to furnish basic data for planning vocational programs in advance of industry's occupational requirements for retrained and upgraded personnel.

# CHAPTER XII. VOCATIONAL EDUCATION INFORMATION NEEDS AND SYSTEM

This chapter explores the potential avenues for more fruitful communication between the Employment Service and the vocational education establishment in the Milwaukee SMSA and some of the means that might be employed to enlarge and improve the information base for program determinations.

In order to aid progress toward the achievement of a common goal -- the effective counseling and placement of trained workers in appropriate jobs -- PROJECT VISION emphasized throughout the urgent need of the Employment Service to understand the scope and character of the labor market information required by the local vocational education system for realistic curriculum planning. Its premise was that it is the responsibility of the Employment Service to attempt to design and produce, within budgetary limitations, the statistical and descriptive facts on needs for vocational training. At the end of the 2-year period of research, it was clear that insufficient understanding of the prerequisites had been achieved. At the same time it was apparent that the "communication gap" could be narrowed effectively only if both units of government continued to reinforce their efforts toward that end.

Among the areas of potential improvement as seen by PROJECT VISION lie the redesigning of the Area Skill Survey technique with particular reference to the educators' expressed preference for current data and short-term (one or two year) economic forecasts; the strengthening of the vocational education system's research efforts, including a continuing comprehensive evaluation of the results of their own programs; the adoption of a sophisticated three-way communication with employers to achieve a clear understanding of their occupational training requirements and preferences and their ideas on how they could best be met; and, lastly, the introduction of an area-wide computerized information system designed to aid in the execution of the overall training and placement program.

# CHAPTER XIII. TOWARD A COMMON OCCUPATIONAL LANGUAGE

> This chapter discusses the development of a "job clustering" system which relates Employment Service job classifications to appropriate instructional programs of the Office of Education. It was a successful undertaking which contributed to the subsequently published bulletin entitled Vocational Education and Occupations issued by the U.S. Department of Health, Education, and Welfare.

At the time of the passage of the Vocational Education Act of 1963 the Employment Service was handicapped because it had no vehicle for transposing occupational information which it collected and assembled into local vocational education instructional outlines. PROJECT VISION helped to develop, jointly with personnel of the U.S. Department of Health, Education, and Welfare and the U.S. Department of Labor, a cross-classification system which presents occupational groupings in relation to areas of worker knowledge needed for particular entry-level jobs. It is based in part on the Dictionary of Occupational Titles which is used throughout the United States for manpower operational purposes. Because this base is so generally accepted, the resulting occupational groupings can be used not only by educators but also by industry and trade associations. The chapter includes, for illustrative purposes, sample pages from the Occupational Cluster Guide as developed by PROJECT VISION. Also included are sample pages demonstrating a technique for converting new instructional programs to specific courses in the Milwaukee Vocational, Technical, and Adult school system.

The results were so successful that practical use was made of the Guide and the conversion tables almost immediately by the Milwaukee vocational system. It has also been applied to other projects under way in the Research and Statistics Division of the Wisconsin State Employment Service.

# CHAPTER II

# SCOPE AND LIMITATIONS OF THE STUDY

## NATURE OF THE CONTRACT

During the unprecedented economic boom of the middle and late 1960's, it was not unusual in America's urban centers for labor shortages in certain occupations to exist side by side with high unemployment rated among certain groups in the labor force. As one means of addressing this paradox, labor economists advocated that vocational and technical training be geared as closely as possible to the occupational needs of employers. Efforts along this line could only be effective if based on accurate, timely information about current and future demand-and-supply patterns for trained personnel. Unfortunately, in spite of much effort, a satisfactory information system for this purpose did not exist even in 1966, when PROJECT VISION was funded.

As early as the midfifties, the U.S. Bureau of Employment Security had recognized the problem. It began to encourage State Employment Security agencies to prepare Area Skill Surveys as a basis for planning community-wide vocational training and upgrading those efforts for individuals in the labor force, as well as for those who would be entering the labor market for the first time. Essentially, these were employer surveys requesting a representative sample of employers in a community to project their skill needs by occupation for a period of up to five years in the future. Over the years the Area Skill Survey technique proved useful in many localities. However, it was recognized that the results often fell short of the stated objective.

Additional responsibilities in this field of endeavor were placed on the State Employment Security agencies with the passage at the national level of the Vocational Education Act of 1963. This act made the Employment Service agencies responsible for providing labor market information to vocational educators for the purpose of curriculum development.

With these two considerations in mind, the U.S. Department of Labor funded a number of research projects for the purpose of developing less costly and more accurate projective techniques. One such project was given to the Wisconsin State Employment Service in August 1966. Its mandate was the development of a comprehensive system for collecting, analyzing, and disseminating occupational and employment information.

OBJECTIVES

Essentially, it was intended that PROJECT VISION would evaluate any labor market determinant affecting a model occupational information system, and recommend further research if current information was not available or the means of acquiring it were inadequate. The directive from the national office of the Bureau of Employment Security under which PROJECT VISION operated specified that the project was to experiment with occupational projection techniques in the Milwaukee, Wisconsin SMSA (Standard Metropolitan Statistical Area),[1] evaluating them in terms of accuracy, cost, and usefulness to local vocational educators.

In agreement with the Manpower Administration of the U.S. Department of Labor, PROJECT VISION undertook the following as major activities during two years of research:

1. A test of an Experimental Employer Needs Survey patterned after the technique described in the Area Skill Survey Handbook issued by BES, November 1965,[2] with innovative features included.

2. An experiment with other employer-based approaches to estimating occupational needs as alternatives to the Area Skill Survey approach.

3. A test of the Occupation-by-Industry Matrix Technique, Method A, approached described in Tomorrow's Manpower Needs.[3] 5

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[1] For detailed explanation of SMSA's, see U.S. Bureau of the Budget, Standard Metropolitan Statistical Areas (GPO, 1967).

[2] USES, Bureau of Employment Security, Handbook on Employment Security Job Market Research Methods, Area Skill Survey, BES No. E-252 (GPO, Nov. 1965).

[3] U.S. Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Vol. IV: The National Industry-Occupational Matrix and Other Manpower Data (GPO, Feb. 1969).

4. A test of a new technique for long-range occupational forecasting described in the article entitled, "Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting," by Norman Medvin in Employment Service Review, January-February 1967.[4] [5]

5. The development of an occupational clustering system which relates occupations to vocational education subject areas (to be completed in cooperation with the U.S. Office of Education).

6. The definition of local vocational education information needs as a basis for evaluating the experimental labor market research techniques tested.

7. The development of occupational information presentation techniques leading to improved communication between vocational education personnel and labor market analysts.

Priority was given to two of the above-mentioned activities: the Experimental Area Skill Survey and the Occupation-by-Industry Matrix approach.

In addition to the major activities, PROJECT VISION also considered the following labor market determinants as they might relate to a model occupational and employment needs information system:

1. Collection, analysis, and evaluation of information obtained from schools and employers on the potential supply of trainees in the labor market area.

2. Evaluation of information from various area sources on the in- and out-migration of workers.

3. Evaluation of information on job shifts obtained from files of the Wisconsin State Employment Service Youth Opportunity Center in Milwaukee, Wisconsin.

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[4] Norman Medvin, "Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting," Employment Service Review, 4, Nos. 1 and 2 (Jan.-Feb. 1967), 61-74.

[5] Although the published presentation of these approaches occurred after work on PROJECT VISION was under way, the design of the approaches had been previously determined. In both instances PROJECT VISION was permitted access to working drafts.

## STAFFING

The Wisconsin agency used both labor market analysis and occupational analysis in conducting research for PROJECT VISION. It was felt that this blending of disciplines would make maximum use of techniques known to both areas. The staff therefore included two occupational analysts, two statisticians, an economist, and a former Employment Service District Office supervisor in addition to the project supervisor.

## LIMITATIONS

In reviewing the results of PROJECT VISION, with a view to the application of the techniques in other labor market areas, it is necessary to bear in mind the characteristics of the labor market in which the research was conducted as well as certain limitations in subject areas of the research itself. These factors do not greatly restrict the value of the findings, but they are pertinent to any interpretation of the conclusions and recommendations.

Important local influences on the results were the industrial nature of the Milwaukee SMSA and its geographical size. Because it is a large, multi-industry urban labor market, its industry staffing problems and the means of solving them tested by PROJECT VISION are more or less applicable to other medium and large urban areas with diversified industries. However, many of the tested techniques and procedures would not be required or probably should not even be considered for use in smaller, less industrialized labor market areas. In many areas, in fact, the Employment Service district managers and school administrators may understand the personnel and training needs in their localities without having to rely on formal surveys. Certainly, a city of five or ten thousand in a rural setting would employ few of the procedures needed in the Milwaukee SMSA.

Of greater significance is the fact that PROJECT VISION was directed to focus its efforts primarily on the evaluation of previously designed techniques rather than on development of innovations of its own. Exceptions to this were some innovative features introduced into the Area Skill Survey technique and the experimental employer-based approaches to determining occupational needs. Also, although this report does not present the findings, there were some pilot efforts in the direction of an activity-oriented technique as a means of solving the complex problem of simultaneously determining skill needs in thousands of different firms in a large multi-industry area. The study of the Metal Casting industry (Chapter V), which was developed along this line, gives sufficient indication of the effectiveness of this type of approach for PROJECT VISION to recommend further work in this direction. Basically, however, the project tested existing techniques rather than designing new ones.

PROJECT VISION recognizes, further, that two important areas of information for which knowledge was inadequate were not sufficiently studied, namely,

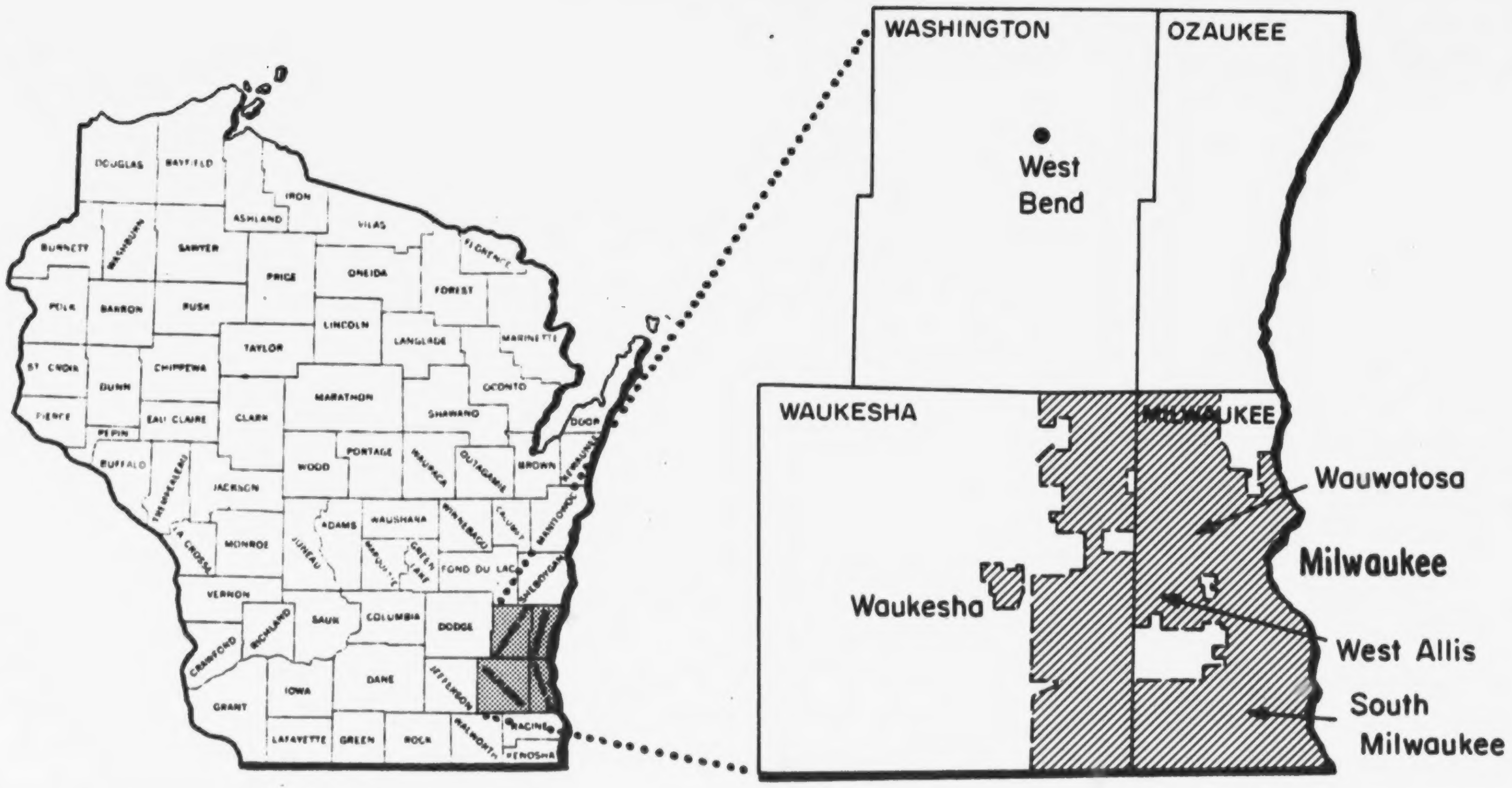
1. Labor market information requirements of vocational school administrators upon which management decisions regarding curriculum programming could be judiciously based.

2. The problems of acquiring and interpreting potentially useful labor market supply information.

The efforts along these lines, as will be seen in the report, were little more than exploratory. However, further knowledge of both areas is crucial to the intelligent application of occupational projection information. Both areas are in need of creative pioneering by experts, particularly those experienced in the field of vocational education.

# LOCATION OF MILWAUKEE SMSA AND ITS MAJOR URBAN AREAS

WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICHIGAN
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NO CAROLINA
VIRGINIA
WEST VA
PENNSYLVANIA
NEW YORK
MD.
DC
DEL
N.J.
CONN
R.I.
MASS
VT.
NH
MAINE


DOUGLAS
BAYFIELD
IRON
ASHLAND
VILAS
BURNETT
WASHBURN
SAWYER
PRICE
ONEIDA
FOREST
FLORENCE
POLK
BARRON
RUSK
LINCOLN
LANGLADE
MARINETTE
TAYLOR
ST. CROIX
DUNN
CHIPPEWA
MARATHON
OCONTO
PIERCE
PEPIN
EAU CLAIRE
CLARK
SHAWANO
DOOR
BUFFALO
WOOD
PORTAGE
WAUPACA
OUTAGAMIE
BROWN
KEWAUNEE
TREMPEALEAU
JACKSON
ADAMS
WAUSHARA
WINNEBAGO
CALUMET
MANITOWOC
LA CROSSE
MONROE
JUNEAU
MARQUETTE
GREEN LAKE
FOND DU LAC
SHEBOYGAN
VERNON
RICHLAND
SAUK
COLUMBIA
DODGE
CRAWFORD
GRANT
IOWA
DANE
JEFFERSON
RACINE
LAFAYETTE
GREEN
ROCK
WALWORTH
KENOSHA
WASHINGTON
OZAUKEE
West Bend
WAUKESHA
MILWAUKEE
Wauwatosa
Milwaukee
Waukesha
West Allis
South Milwaukee

**STATE OF WISCONSIN**

**MILWAUKEE SMSA**

# CHAPTER III

# MILWAUKEE SMSA MANPOWER SETTING AT TIME OF RESEARCH

The Milwaukee SMSA includes Milwaukee, Waukesha, Ozaukee and Washington Counties, an area covering approximately 1,460 square miles. This 4-county area is located in southeastern Wisconsin, its southern border about 25 miles north of the Wisconsin-Illinois state line. Milwaukee and Ozaukee Counties are bordered on the east by Lake Michigan and on the west by Washington and Waukesha Counties. The outer boundaries of the SMSA are from 15 to 50 miles from the city of Milwaukee, the largest city in the area (see map, p. 26). While the four counties cover less than 3 percent of the land area of the State, they include more than one-third of the State's population.

## POPULATION CHARACTERISTICS

Milwaukee County dominates the SMSA population picture; however, as seen in Table 1 below, the three smaller counties accounted for more than half the total estimated population increase during the period 1960-1967.

TABLE 1.--Milwaukee SMSA Population by County 1960 and 1967

| County | 1960 | 1967 (estimated) | Increase 1960-1970 |
|---|---|---|---|
| SMSA Total | 1,278,850 | 1,487,318 | 208,468 |
| Milwaukee | 1,036,041 | 1,139,714 | 103,673 |
| Ozaukee | 38,441 | 52,269 | 13,828 |
| Washington | 46,119 | 55,858 | 9,739 |
| Waukesha | 158,249 | 239,477 | 81,228 |

Sources: U.S. Census of Population; Dept. of Rural Sociology, University of Wisconsin

Between 1960 and 1967, the year of the Experimental Employer Needs Survey, population in the Milwaukee SMSA increased from 1,278,850 to an estimated 1,487,318, a growth of 16.3 percent. This rate of increase was considerably more rapid than the Wisconsin state-wide increase of 8.3 percent and the national increase of 10.2 percent in the same period.

## INDUSTRIAL CHARACTERISTICS

The Milwaukee SMSA is one of the leading manufacturing centers in the Nation. Industry is principally located in Milwaukee County in its urban centers of Milwaukee, West Allis, Wauwatosa and South Milwaukee. Important industrial areas outside of Milwaukee County are found in the cities of Waukesha (Waukesha County) and West Bend (Washington County).[1]

The principal industrial classifications represented in the Milwaukee SMSA are:

- engines and turbines
- automotive equipment and assembly components
- electrical control apparatus
- construction and mining machinery
- iron and steel foundries
- malt liquors
- metal working machinery
- structural metal products
- electric motors and generators
- nondurable goods categories of food and kindred products
- printing and publishing and allied industries

Almost 40 percent (38.9 percent in August 1967) of the area's total nonfarm wage and salaried workers are engaged in manufacturing, compared with a national average of about 30 percent. Nearly two-thirds (64.3 percent in August 1967) of all factory workers are employed in electrical and nonelectrical machinery and primary and fabricated metal products. The value added for manufactured products in the Milwaukee SMSA was approximately $3,044 million in 1966.[2]

The most important nonmanufacturing industries are wholesale and retail trade, service, and government, which account for more than two-thirds of all nonfactory employment. Women comprise slightly more than one-third of all nonfarm wage and salary employment in the area.

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[1] The 1960 population in major urban areas of Milwaukee SMSA was as follows: City of Milwaukee, 741,324; West Allis, 68,157; Wauwatosa, 56,923; South Milwaukee, 20,307; City of Waukesha, 36,339; West Bend, 11,538. Source: U.S. Census of Population. For reference, see map of the SMSA with its major urban centers and location in the State, p. 26.

[2] U.S. Bureau of the Census, Statistical Abstract of the United States: 1969 (90 ed., GPO, 1969), Table 1, "Metropolitan Areas--SMSAs With 250,000 Population or More" (pp. 864-895), p. 893.

## MANPOWER CHARACTERISTICS

PROJECT VISION initiated the field work for the Milwaukee Experimental Employer Needs Survey in August 1967. Therefore, the manpower statistics for August of that year are given in some detail to provide a background for the presentation and interpretation of the survey itself and the related experiments which were undertaken during the latter months of 1967 and early 1968. In the summary table below (Table 2), the estimated number of people in the work force and their distribution by employment status in August 1967 are shown.

TABLE 2.--Employment Status of People in the Work Force
Milwaukee SMSA -- August 1967

| Employment Status | Number | Percent |
|---|---|---|
| Total Work Force | 615,100 | 100.0 |
| Total Employed Workers | 594,900 | 96.7 |
| Nonfarm Wage and Salary | 548,000 | 89.1 |
| Other Nonfarm | 38,800 | 6.3 |
| Farm | 8,100 | 1.3 |
| Unemployed | 19,300 | 3.1 |
| Involved in Labor-Management Disputes | 900 | 0.2 |

Source: Wisconsin State Employment Service, "Wisconsin Work Force."

The unemployment rate of 3.1 percent for the Milwaukee SMSA in August 1967 was substantially below the rate of 3.6 percent for Wisconsin and 3.7 percent for the Nation in the same month. It is an important characteristic of the Milwaukee SMSA that from November 1965 through the time of the study the area was consistently classified in the low unemployment group, Group B, in the Department of Labor's classification of major areas on the basis of unemployment.[3]

The Experimental Employer Needs Survey was undertaken by PROJECT VISION at a time of relatively high employment. Not only was the unemployment rate of 3.1 percent in the area significantly low, but the August employment levels in most industry groups were as high as or slightly higher than the yearly averages for 1967. As seen in Table 3 below, the only industries showing lower-than-average employment in August were the major group Wholesale and Retail Trade and the manufacturing categories of Transportation Equipment and of Paper and Allied Products.

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[3] Adequacy of labor supply estimates are prepared monthly by the USTES and published in Area Trends in Employment and Unemployment by the Manpower Administration, U.S. Department of Labor.

TABLE 3.--August Employment and Average Yearly Employment of Nonfarm Wage and Salary Workers by Industry Group
Milwaukee SMSA -- 1967
(Estimated)

| Industry Group | August | Yearly Average |
|---|---|---|
| Total Nonfarm Wage and Salaried Workers | 548,000 | 544,500 |
| All Manufacturing | 213,100 | 212,600 |
| Durable Goods | 161,300 | 161,100 |
| Lumber & Wood Prod. (incl.Furn.) | 2,900 | 2,800 |
| Stone, Clay & Glass Prod. | 2,100 | 2,000 |
| Primary Metal Industries | 19,000 | 19,000 |
| Fabricated Metal Products | 18,900 | 18,400 |
| Machinery (Excl. Electrical) | 60,200 | 60,000 |
| Electrical Machinery,Equip. & Sup. | 38,900 | 38,300 |
| Transportation Equip. | 10,600 | 12,200 |
| Instruments & Related. Prod. | 4,500 | 4,300 |
| Other Durable Goods | 4,200 | 4,100 |
| Nondurable Goods | 51,800 | 51,500 |
| Food and Kindred Prod. | 19,000 | 18,500 |
| Apparel and Other Textile Prod. | 4,200 | 4,100 |
| Paper and Allied Products | 4,400 | 5,000 |
| Printing,Publishing & Allied Inds. | 11,900 | 11,700 |
| Chemicals and Allied Prod. | 3,100 | 3,100 |
| Leather and Leather Prod. | 6,700 | 6,700 |
| Other Nondurable Goods | 2,500 | 2,400 |
| Nonmanufacturing | 334,900 | 331,900 |
| Contract Construction | 26,800 | 24,200 |
| Transportation & Public Utilities | 30,000 | 29,800 |
| Wholesale and Retail Trade | 112,100 | 112,800 |
| Finance, Insurance & Real Estate | 26,200 | 25,700 |
| Services -- Personal, Business & Other | 74,600 | 74,500 |
| Government | 65,200 | 64,900 |

Source: Wisconsin State Employment Service, "Wisconsin Work Force."

The high level of employment in the area continued for the rest of the year, during which time the survey follow-up studies and other experimental approaches were undertaken. In the final quarter of 1967, Milwaukee area nonfarm wage and salary employment rose steadily from the August level. Among major industry groups, Contract Construction and Manufacturing failed to follow this trend. Employment in Contract Construction tapered off somewhat from the summer quarter, but remained well above the first two quarters. Manufacturing registered its lowest employment level of any of the four quarters. All other classifications showed increases in the final quarter over all previous quarters, with the most conspicuous employment growth being registered in Trade and Government.

The severe manpower shortages of 1966 were reported to have eased somewhat early in 1967, at least in unskilled and semiskilled occupations. However, *unfilled demands of long standing continued* in the health, engineering, accounting, chemistry, clerical, sales, food service, metal machining and maintenance fields.[4] In August 1967, the Milwaukee District Employment Service office[4] cited *shortages* in such specific occupations as typist, stenographer, secretary, and drill press set-up operator, engine lathe set-up operator, turret-lathe set-up operator, welder-fitter, and milling-machine set-up operator. At the same time, the employment office reported *surplus* labor supply in the following: trade and service managers, buyers, shipping and receiving clerks, cashiers, kitchen helpers, janitors, various foundry workers, punch press operators, assemblers, spray painters, truck drivers, and various unskilled workers.

Finally, to complete the commentary on the Milwaukee area manpower setting during the period of PROJECT VISION research, it is important to note that not only was the Milwaukee SMSA area one of relatively low unemployment but it was also an area in which average hourly wage rates and weekly earnings were relatively high. Table 4 summarizes these characteristics in relation to the same figures for the State of Wisconsin and for the Nation. It can be assumed that these favorable earnings resulted from the highly industrialized character of the Milwaukee County portion of the area and in particular from the character of the major industries that require a high proportion of skilled workers.

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[4] In 1967 the geographic area served by the Milwaukee District Employment Service office was comprised of Milwaukee and Ozaukee Counties.

TABLE 4.--Hours and Earnings of Production Workers in Manufacturing in Milwaukee SMSA, Wisconsin, and the United States
August 1967

| Type of Earnings and Hours of Work | Milwaukee SMSA | Wisconsin | United States |
|---|---|---|---|
| Average Weekly Hours | 40.7 | 40.9 | 40.7 |
| Average Hourly Earnings | $ 3.28 | $ 2.95 | $ 2.82 |
| Average Weekly Earnings | $133.30 | $120.84 | $114.77 |

Source: Wisconsin State Employment Service, "Wisconsin Work Force."

Public and private educational institutions carry a heavy responsibility for the adequate preparation of local workers to meet the labor demands of the industrial complex in the Milwaukee SMSA. The City of Milwaukee's public vocational school is the largest in the Milwaukee SMSA and its dozen or more private business, technical, and trade institutions offer virtually every type of course, ranging alphabetically from accounting to welding. More limited course content is furnished in the five public vocational schools in the less populated counties. However, the Waukesha public vocational school offers a fairly extensive range of courses. Some of the area's hospitals are also sources of trained personnel. The nearly 90 public and private high schools in the area must not be omitted from this appraisal since they offer vocationally-oriented courses in several occupational areas and since nearly one-third of them have received some Federal reimbursement for senior-year vocational training programs.

During the 1960's an innovative program offering occupational training for unemployed and underemployed workers was undertaken by the Wisconsin State Employment Service and vocational education agencies as part of the national program under the Manpower Development and Training Act.[5] It is an indication of the Milwaukee SMSA as an industrial base, as a manpower source, and as a community offering vocational training facilities of excellence and broad scope that roughly half of the State MDTA financial resources for this purpose are allocated to the Milwaukee SMSA. Since courses offered by the MDTA change according to the MDTA program needs in the area, no valid generalization can be made about their course content.

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[5] U.S. Congress, Manpower Development and Training Act of 1962, Public Law 415, 87th Cong., 1962. (Referred to throughout as "Manpower Development and Training Act of 1962.")

# CHAPTER IV

# THE EXPERIMENTAL EMPLOYER NEEDS SURVEY

## SUMMARY

A primary objective of PROJECT VISION was to experiment with certain occupational employment projection techniques in order to facilitate development of a model occupational information system oriented to the needs of vocational educators. A considerable part of PROJECT VISION's research effort was devoted to a "test" of the Bureau of Employment Security Area Skill Survey Concept.[1] Within this framework, PROJECT VISION conducted its own experimental area Needs Survey in the Milwaukee SMSA[2] which was a modification of the standard BES survey technique. PROJECT VISION's experiment will be referred to throughout as the "Experimental Employer Needs Survey."

The BES Area Skill Survey technique was developed to serve as a comprehensive means of arriving at future occupational demand for a labor market area. It was based on individual employer forecasts of their projected needs in selected occupations, taking into account both replacement and expansion, or contraction, of employment in their establishments.

In working with all phases of any Area Skill Survey, from the early planning stages through the final analysis, presentation, and use of the results, many judgments come to be made by the research staff. These particularly relate to the adequacy of the underlying concepts and to the limitations of the data obtained. In PROJECT VISION this was carried one step further, namely, to the evaluation of each phase of the study for the express purpose of making recommendations for the improvement of the standard Area Skill Survey techniques in order to obtain more meaningful results. A summary of the positive and negative aspects of the Area Skill Survey, as it was carried out in the Milwaukee SMSA during the summer and fall of 1967, follows. Also presented briefly are recommendations which PROJECT VISION's staff urges be given consideration in any comprehensive revision of the currently used methodology.

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[1] U.S. Department of Labor, Bureau of Employment Security, Handbook on Employment Security Job Market Research Methods, Area Skill Survey, BES No. E-252 (GPO, Nov. 1965).

[2] For a geographic description of the Milwaukee Standard Statistical Metropolitan Area (SMSA), see Chapter III, p. 27.

Much of the Experimental Employer Needs Survey technique was used successfully. Data collected on current employment by occupation for a SMSA the size of the Milwaukee area were particularly valuable and comprise one of the major contributions of the Area Skill Survey technique. It was rewarding, in addressing so many employers, to be met with a generally cooperative response and a willingness to spend valuable manhours on the survey. It was heartening that no employer refused to answer the questionnaire out of disenchantment with the Wisconsin State Employment Service. Much of the credit for this acceptance can be attributed to the early interest of the Metropolitan Milwaukee Association of Commerce, with whose support and cooperation the survey was launched.

From a technical point of view, a specially prepared sampling method based on the Unemployment Compensation Division's listing of employers according to the Standard Industrial Classification (SIC)[3] was judged to be one of the best methods yet developed for the selection of a representative industry sample using that source. Important also was the finding that statistically there was no significant difference between the responses to questionnaires with a prelisted occupational stub as compared with an open-end stub to which additional occupations may be added by the respondent. The importance of this lies in the research analyst's preference for the prelist over a list comprised of employers' often ambiguous job titles.

Some other aspects of the survey were less successful. This was particularly true of the choice of three and five years as the time expanse for the two projection periods for future employer needs by occupation. Since it was found that the average employer did not make his forecast on a scientific or formal basis, it is concluded that the long forward estimates are subject to an unknown degree of error. For the most part, employers' answers were educated opinions made in the context of the company employment picture at the time of the survey. Moreover, it is unlikely that an employer had prepared in previous years a forecast of future skill needs for nonmanagement occupations and probably saw little reason to introduce the procedure. Significantly, even the few employers in Milwaukee responding to the questionnaire who did practice the art of manpower forecasting were not confident of the results of their efforts. Finally, certain industries, such as construction companies and subcontractors, did not find it feasible to make skill projections beyond one year.

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[3] The Standard Industrial Classification was prepared by the Office of Statistical Standards of the Bureau of the Budget, Executive Office of the President. It is presented in the Standard Industrial Classification Manual (GPO, 1967 ed.). The usual practice of referring to it as the SIC will be followed in this report.

Another problem area developed in regard to the Area Skill Survey's basic assumptions. Although the underlying assumptions for preparing estimates for the projection periods were carefully thought out and presented, most employers ignored them and based their projections on their own unstated assumptions. To them it was not realistic, for example, to assume that prevailing economic conditions would remain unchanged for a 3- or 5-year period or to assume that qualified workers would be available to meet anticipated employment demands.

If the whole problem of attempting long-range forecasting was the principal difficulty encountered in achieving useful results in the Experimental Employer Needs Survey, it is only fair to point out that it was not unexpected since a forewarning came in the pretest period of developing the questionnaire. The experimental nature of PROJECT VISION warranted proceeding with the concepts in spite of the expressed reservations by some employers in that early period. However, it does point up the value of a pretest, and suggests that from a practical point of view reliance may well be placed in certain instances on the judgment of those who will be participants in such Area Skill Surveys.

Next in importance to the forecasting difficulty was the misunderstanding or misinterpretation of certain sections of the mail questionnaire by some employers. How much this contributes to errors in the final results is difficult to ascertain, but it could be to a substantive degree in a schedule as complex as that used by PROJECT VISION. During follow-up interviews it became especially evident with respect to questionnaire items pertaining to training and replacement needs. At that time employers revealed that they had understood "replacement needs" to be "turnover rates." Similarly, uniform "turnover rates" were sometimes reported for all occupations in a shop since such rates were calculated only on a shop basis. With regard to future in-plant training programs, "OJT training" (on-the-job training) proved to be such a nebulous term on the survey's mail questionnaire that, in general, employers were unable to provide data of consequence with regard to it.

Two other aspects of the Area Skill Survey technique as carried out in the Milwaukee SMSA were judged to be prejudicial to the effectiveness of this mail survey. Because they may be inherent in the procedure, and therefore could be confronted in other area surveys, they are included here on the problem side of the evaluation. First, a number of important large employers failed to respond because they claimed that it was too time-consuming to gather data and prepare projections for occupations scattered throughout a number of shops in the company. Sometimes expressed, other times implied, "too time-consuming" was closely related to the costs that would be involved in preparing the estimates. In most instances of nonresponse for this reason, follow-up efforts in person or by mail were also unsuccessful. Second, on the other side of the fence, those responsible for making the survey also have a time problem. The long lead time required for planning and preparation before an Area Skill Survey actually gets under way makes the method vulnerable to radical changes in the labor market situation and the conditions under which it is then conducted. Equally important, an Employer Needs Survey often requires 12 to 18 months to be completed. This tends to limit its ultimate value, which must be measured in part in terms of the timeliness of its recommendations to administrators of vocational education programs.

Finally, it must be recognized by those administering skill surveys that problems involved in the interpretation of the data for educational planning purposes are compounded when attempts are made to relate supply to demand patterns. It may be difficult to draw conclusions valid enough to lead to intelligent management decisions.

It is PROJECT VISION's suggestion that, although a basic revision of the method would seem to be indicated, the same amount of effort might bring greater practical results if it were applied to developing a somewhat different basic approach. It must be granted that until a new type of approach were undertaken for the first time and the results tested, its value would remain uncertain. However, in the hope of generating productive discussion of underlying concepts, PROJECT VISION offers a suggested new design for an Area Employment Benchmark Survey. It is presented at the end of this chapter.

Discussions concerned with procedures, findings, and recommendations under the following headings make up the body of this chapter:

Scope and Methodology
Evaluation of the Occupational Data Obtained in
  the Light of Problems Encountered
Special Follow-up Survey of Selected Employers
Factors Influencing Respondents' Occupational Projections
Area Employment Benchmark Survey: A New Approach

## SCOPE AND METHODOLOGY

It must be emphasized that the Experimental Employer Needs Survey was conducted by PROJECT VISION in order to test the Area Skill Survey as a technique for gathering occupational and employment information. It was not the purpose of the study to conduct a survey in order to publish results in terms of statistical data.[4] Rather, it was the intent of the Project staff to evaluate the survey technique in terms of its workability and the reliability of the data it generated as well as its usefulness in providing information pertinent to vocational education planning. The procedures followed, problems encountered, and evaluations made in the course of completing the survey and conducting follow-up studies are fully presented. The chapter concludes with basic recommendations regarding modification of the standard Area Skill Survey questionnaire, and introduces ideas for a new approach under the title of. Area Employment Benchmark Survey: A New Approach.

This section is concerned with questionnaire design, sampling design, and an outline of procedures followed in conducting the survey in the Milwaukee area.

### Questionnaire Design -- Variations from Standard Area Skill Survey

### 1. Pretest

During the two months preceding the Survey questionnaire mailing (August 1967), the Project staff spent considerable time in the development of the questionnaire, including a number of innovative features. After completing the first draft, the staff met with representatives of the following organizations to discuss practicability of the proposed design:

Metropolitan Milwaukee Association of Commerce
Graphic Arts Association of Milwaukee
Wisconsin State Board of Vocational, Technical, and Adult Education
Associated General Contractors of Greater Milwaukee, Inc.
Milwaukee Institute of Technology (now Milwaukee Technical College)
Milwaukee School of Engineering
Wisconsin Chapter of American Society of Training and Development
Twelve Milwaukee employers in various industries, including both small and large firms

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[4] As indicated throughout this report, questions arose regarding many of the data generated by the survey. However, employment and projection data on some 90 occupations are presented in Appendix H.

In addition, the tentative questionnaire was reviewed with State and local apprenticeship officials during this period, although not as part of the pretest.

In general, the employers included in the pretest reacted with interest to the planned survey. At the same time they expressed misgivings about certain survey questions as well as the length of time that would be required to complete such a complicated questionnaire. A number of changes were incorporated to make the questionnaire as clear as possible to employers. A definition of formal in-plant training was added to avoid confusion with informal on-the-job training.

The employers' reactions to certain aspects of the preliminary design of the questionnaire are presented briefly. It is of primary interest that certain of their reservations in this early stage anticipated quite accurately the responses of many of the employers who later actually participated in the survey:

> Questions relating to changes in plant capacity, product line, and location brought mixed reaction. Employers in branch plants indicated they might not know about future plans, although many said they participated in planning.
>
> Adequate 3- and 5-year estimates were generally considered to be extremely difficult for the number who would complete in-plant training or be promoted.
>
> Estimates of replacement needs for a year ahead were thought to be possible but age-sex breakouts for current employment were considered to be difficult.

## 2. Development of Occupational Stub

Undertaking an extensive employer survey with the intent of prelisting occupations on portions of the survey form posed many of the same problems encountered in previous manpower surveys. The most significant problem was how to determine and list the greatest number of titles without adversely affecting either the response to the survey or the accuracy of the results. In an effort to arrive at the best possible method of presenting the occupational titles, the Project staff examined various skill surveys from other areas of the country.

As a result of this analysis, it was decided to develop eight different sections of occupational titles. A common, or general, section would contain a listing of occupational titles found in the following areas: professional, data processing, medical service, and clerical. The other seven major divisions would be tailored to the major SIC divisions and to the Printing and Publishing industry as follows:

Construction
Manufacturing
Transportation, Communication, and Utilities
Retail and Wholesale Trade
Finance, Insurance, and Real Estate
Services
Printing and Publishing

An extensive listing of occupations was developed for the Printing and Publishing industry because it is significant in the Milwaukee area and the SIC manufacturing division does not give it proper coverage.

The following criteria were then used to govern the selection of specific titles for each of the major divisions:

Occupations for which shortages had been demonstrated, either through previous manpower studies or studies made of unfilled job openings.

Occupations for which training is necessary and was available or feasible through local vocational education institutions.

Occupations numerically significant in the area. (Sources of information to include 1960 Census data and titles listed in the newly developed BLS Matrix[5].)

Occupations for which information had been requested of the State Employment Service by vocational educators or by the Milwaukee Metropolitan Association of Commerce.

Certain other factors also influenced the selection of the titles, including possible conversion to codes in the Dictionary of Occupational Titles[6] significant to local industry, and the relationship of specific titles to the HEW curriculum guidelines. Considerable reliance was placed on local intelligence and available industry experts to assist in the development of the lists.

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[5] For further details concerning the BLS Matrix, see Chapter VIII.

It was planned that each of the firms included in the survey would receive the common occupational listing plus the list of occupations relating to the major division in which the firm was classified. Although the titles were prelisted, space was provided for employers to list additional occupations of significance to their firm and industry.

After completing the selection of titles according to the preceding structure and criteria, the occupational listings were distributed to various employers and vocational education authorities for their comments. Meetings were arranged with these persons during July, and every effort was made to incorporate their suggestions into the final occupational listing.

A number of additions and deletions were made at the suggestion of the employers. Also, subheadings were added in order to delineate the various occupational groups because employers felt this would make it easier for them to locate specific titles, and would give them an idea of where to list titles that would not appear on the survey form.

Vocational educators offered only a few new or changed occupational titles. Their interest in the recently developed cluster concept led them to suggest experimenting with employer response to rather general curriculum titles. The title "Marketing Administration Occupations" is an example of this type of title added to the listing.

Vocational education authorities also made a specific recommendation in regard to the structure of the listing of titles. They considered it extremely important for employers to associate a given technical occupation with its professional counterpart, if for no other reason than the wide disparity in titles used throughout industry. The "engineering team" type of relationship was stressed because of the vital role that the technical person plays in such an arrangement. They thought this concept should be tried throughout the listing wherever hierarchical relationships exist. Since questions arose as to the actual usage of such a concept, it was agreed to try this arrangement in the engineering area only, where the existence of technical personnel and a hierarchical structure are established to some degree. Ultimately, such an arrangement was also developed for data processing and health occupations within the limits imposed by the relatively few occupations in these fields included in the survey.

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[6] U.S. Department of Labor, Bureau of Employment Security, Dictionary of Occupational Titles (3rd. ed., GPO, 1965). Referred to throughout as DOT.

Appendix A (pp. A2-A12) presents the final listing of titles, the employer suggestions incorporated into the listing, and the "professional-technical" groupings referred to above.

## 3. Description and Rationale of Questionnaire Design

Part I, the General Questionnaire page, was issued in the same form to all employers in the sample. Part II, requesting employment data by occupation, was issued in three basic designs to correspond to an employer's subsample designation. These are described under Part II (pp. 42-43). Part II of the questionnaire, in the appropriate form, was sent to each employer depending on the industry designation of his business as well as on the subsample group to which it had been assigned. Chart I, Experimental Design Approach Summarized (p. 44) presents the questionnaire design. Approximately 25 questionnaires were taken to the largest employers during personal visits; all others were delivered by mail. (See App. B, pp. B2-B10, for instruction sheets and sample pages from Parts I and II.)

### PART I -- General Questionnaire

Question 1 asks for the name and address of the home office if the company is a branch of a larger corporation. This was included in case it should become necessary to contact the home office, and to identify possible duplication of firms.

Questions 2 and 3 call for *yes* and *no* responses to questions regarding past and future plans for expansion, relocation, and changed product lines. These were asked as indicators to be used in selecting companies for later personal contact and, for analytical purposes, as possible pointers toward a different occupational mix resulting from new plants, products, or technology. The questions were intended as "leading indicators" only; the industrial diversity of the companies covered made more specific questions impossible. An increase in capacity of 25 percent or more was used as a criterion to identify those companies undergoing expansion. No definition of "capacity" was given.

> Questions 4 and 5 ask whether the establishments have formal training programs, and, if so, the occupations they are designed for. A definition of "formal training program" was included on the questionnaire page. It was thought that the listing of occupations would help in the later analysis of the extent of training and might also indicate whether the employer had misread the definition of "formal" training.

Personal interviews with employers were thought to be necessary to appraise their training programs, since the issues involved in differentiating between types of training conducted or sponsored by employers are too complex to be highlighted by a mail questionnaire. Therefore, a series of in-depth interviews was planned to provide the basis for an assessment of formal employer training programs and an analysis of their training potential in the area. A distinction was made between training designed to make an employee a more effective worker and training given to qualify him for a given occupation.

## PART II -- Employment Data by Occupations (Three Basic Designs)

Three basic designs were developed for Part II of the survey questionnaire to enable experimentation with the following two variables:

> Replacement Needs. A control group received questionnaires asking for anticipated replacement needs in 1968. A subsample of employers received questionnaires which asked for an age-sex breakout of current employment by occupation instead of replacement needs. The purpose was to determine whether employers are willing and able to provide such detailed information in a mail survey. Also, it was to be the basis of an experiment to test whether age-sex information by occupation would be more accurate than employers' estimates of replacement needs by occupation. Age-sex breakouts would be used to calculate replacement needs.

> Open-end Occupational Stubs versus the Preselected Occupational Stub Tailored to Industry. The control group received questionnaires with the prelisted stub while a

subsample of employers received them with open-end stubs. The purpose of this was to find out whether the use of an open-end occupational stub would yield additional information on occupations important to a given industry, and, possibly, on emerging occupations.

## Three Basic Questionnaire Designs

Control Questionnaire (see Form 22, App. B, pp. B7-B8) The control questionnaire corresponds to the standard Area Skill Survey, with the following columns:

(A) DOT Code.
(B) The Occupational Stub. Occupational titles were prelisted on the control questionnaire and were tailored to industry groups.
(C) Current Employment.
(D) Anticipated Employment. Although many employers in the pretest indicated that a 5-year projection was too long to be reliable, both 3- and 5-year targets were included in order to assess their ability to make projections for those time periods.
(E) Replacement Needs During 1968. This item was similar to that used in the Area Skill Survey *Handbook*.
(F) Workers Completing Training in 1970 and 1972. This item was similar to that used in the Area Skill Survey *Handbook*.

Experimental Questionnaire A (see Form 21, App. B., pp. B5-B6). Item (B) was the only part that differed from the Control Questionnaire. Instead of containing prelisted occupations, Form 21 uses an open-end stub so that the employer could list his own occupational titles.

Experimental Questionnaire B (see Form 23, App. B., pp. B9-B10). Item (C) was changed on Form 23. Employers were asked to give an age-sex breakout for *Current Employment by Occupation*. The *Replacement Needs Column* (E) was omitted.

CHART I. EXPERIMENTAL DESIGN APPROACH SUMMARIZED

This summary chart is designed to present in a brief and simple way (a) the experimental parts of the survey, (b) the rationale behind each experiment, and (c) the means of securing the additional data.

| | | DATA REQUESTED | RATIONALE | MEANS OF SECURING DATA |
|---|---|---|---|---|
| QUESTIONNAIRE PART I | Short-cut occupational change indicators | All employers in the samples were asked if their firm was a branch plant of a larger corporation. | To determine if branch plants would have special problems in answering the questionnaire. | Follow-up interview. |
| | | For the preceding 5 years and the next 5 years, all employers in the samples were asked about: increased capacity (25% or more)<br>changed product lines<br>relocation | To develop a short-cut method of identifying firms that were "progressive" and thus might have a different occupational mix or emerging occupations. | Follow-up interview. |
| | Formal training indicators | All employers in the samples were asked if they had a formal in-plant training program. | To determine extent of company training comparable to institutional training. | Special interview or phone contact to get details. |
| QUESTIONNAIRE PART II | To experiment with improving technique for obtaining basic data by means of an employer survey | One subsample received a prelisted occupational stub. Another subsample received a completely open-end stub. Employers in the Printing and Publishing industry received a specially tailored prelisted occupational stub. | To determine effect on response rate, number of occupations reported, and difficulty of translating employer titles to DOT titles. | Analysis of survey returns. |
| | | One subsample received a question on number employed by age and sex in individual occupations. Another subsample received a question requesting them to estimate replacement needs for the coming year for individual occupations. | To differentiate the more accurate method and the effect on response rate. | Analysis of survey returns and follow-up interviews. |
| | | All employers in each sample were asked to provide 3- and 5-year occupational projections. | To determine the feasibility of depending on employer occupational projections 3 and 5 years in the future. | Analysis of survey returns and follow-up interviews. |
| | | All employers in each sample were asked to estimate company training output for 3 and 5 years ahead. | To determine the feasibility of employers providing such data. | Analysis of survey returns and follow-up interviews. |

## Sampling Design -- Variations from Standard Area Skill Survey

The technique used in selecting the sample for the Milwaukee Experimental Employer Needs Survey is a modification of that described in Appendix C.3, sec. 12.2-3, of the Current Employment Statistics Manual.[7] This sampling technique is considered to be one of the best yet devised in the selection of a representative sample from the Wisconsin Unemployment Compensation Division's listing of employers by SIC.

The Milwaukee study involved a control and two major subsamples covering nearly 1200 employers in the 4-county Milwaukee SMSA. As previously indicated (pp. 42-43), the three sample groups were designed in order to provide a basis for evaluating several methods of obtaining reliable information from employers on occupational replacement needs. The sample groups were also used as a vehicle to explore possibilities of improving the Employment Service-employer job title communication problem. A description of each of the samples follows:

1. The control sample consisted of half the sample of Unemployment Compensation-covered employers plus three-fourths of the hospitals, government, education and nonprofit organizations having 100 or more employees. All of the companies which were considered to be "atypical" of their SIC groups were also included in this sample. The control group received the prelisted occupational stub, and the employer was requested to make replacement estimates by occupation.

2. One subsample (Subsample A) had one-fourth of the Unemployment Compensation-covered employers in the sample plus one-eighth of the noncovered employers having 100 or more employees. This adjustment was made to permit sample selection on a 2-digit SIC basis. This sample was open-end in that the occupations were not prelisted on the stub. Like the control sample, the employer estimated his replacement needs by occupation.

3. A second subsample (Subsample B) also had one-fourth of the Unemployment Compensation-covered employers

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[7] U.S. Department of Labor, Bureau of Labor Statistics, Current Employment Statistics Manual, Vol. II: Operating Guide (GPO, April 1969).

> in the sample plus one-eighth of the noncovered employers having 100 or more employees. This subsample had the same prelisted occupational stub as the control sample. However, current employment information was asked for by age and sex for each occupation. PROJECT VISION staff would calculate the replacement needs from the data obtained.

The sample was arranged by employer number in ascending order. A book of random numbers was used to determine the starting number. The sample was then divided into four groups. Two groups, the first and third, were designated "control" and were given the prelisted occupational stub with the employer predicting his replacement needs (Questionnaire Form 22, App. B, pp. B7-B8). The second group received the open-end occupational stub, with the employer estimating his replacement needs (Form 21, App. B, pp. B5-B7). The fourth group received questionnaires having the age-sex breakout and the prelisted occupational stub (Form 23, App. B, pp. B9-B10).

An analysis of the subsamples was made in order to determine the distribution of employers in each 2-digit industry and of employers within each 2-digit industry by size of establishment. It was found that approximately one-fourth of each 2-digit industry group was in each of the subsamples and half in the control group. This also held true for the distribution of employers within each 2-digit industry by size of establishment. Thus, the sample design resulted in a satisfactory distribution of firms by 2-digit SIC groups and by company size.

With the sample chosen, and the basic questionnaire designs completed, the Experimental Employer Needs Survey in the Milwaukee SMSA was undertaken in August 1967.

## Conducting the Experimental Employer Needs Survey

Gaining the cooperation of employers was seen as a crucial element in conducting an Employer Needs Survey. Fortunately, the Metropolitan Milwaukee Association of Commerce had previously urged the Wisconsin State Employment Service to conduct such a survey as a means of helping to solve the problem of worker shortages in certain occupations resulting from the tight labor market in Milwaukee. When it was decided to undertake an Employer Needs Survey, the Association was approached. Its members were very much interested in working with PROJECT VISION on the project, and with their cooperation the survey was launched.

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Assistance provided by the Association included introduction of PROJECT VISION staff members to employers for the pretest, suggestions in questionnaire design provided by a consultant to their staff, and arrangements for a publicity campaign run by another professional public relations consultant to their staff.

### 1. Publicity

Publicity consisted of an article on the proposed survey in the Association's newsletter, and a special letter to members of large firms requesting their attendance at an open meeting at which the staff of PROJECT VISION would discuss the survey and its meaning to educators and employers. The meeting at the Wisconsin Telephone Company auditorium drew over 100 area industrialists. Most of those in attendance appeared willing to cooperate in the survey, although their questions indicated that some had reservations about making long-range projections in such detail. Additional publicity releases were given to local newspapers and radio stations by both the Association and PROJECT VISION. No accurate count was made of stories printed, but major city newspapers did report the project.

### 2. Employers Receiving the Questionnaire

A total of 1,174 employers received the Experimental Employer Needs Survey questionnaires. These employers were selected from the 4-county Milwaukee SMSA in accordance with the sampling technique previously noted (pp.45-46).

### 3. Mailing of Questionnaires

Survey questionnaires and cover letters were mailed to the selected Milwaukee area employers in August 1967. Questionnaires were delivered personally to twenty-five of the largest employers.

### 4. Response and Follow-up Studies

Altogether, half (591) of approximately 1,200 employers returned questionnaires containing at least a minimum of usable information for purposes of survey analysis. Follow-up letters were mailed to 583 nonrespondents within a month of the original mailing.

Following the initial tabulation of survey results, certain employers were interviewed to verify data, to obtain additional data, and to test reactions to various aspects of the questionnaire.

Interviews with 127 survey respondents placed emphasis on the employers' ability to make long-range projections, and on the extent of manpower planning and on the existence of in-plant training in their establishments. Interviews with 40 nonrespondents explored reasons for their nonresponse. An additional mail survey of 285 nonrespondents, to which 147 replied, gained information on nonrespondents' recruitment methods and use of vocational schools in the area.

### 5. Special Factors Affecting Response

A number of employers were on vacation during the initial weeks of the survey. This could have resulted in a nonresponse on the part of some who returned to desks piled high with correspondence.

In addition, the City of Milwaukee experienced serious civil disorders in late July and early August of 1967, shortly before the survey questionnaires were mailed. The issues raised by these disturbances no doubt occupied the attention of some employers who might otherwise have devoted more effort to the Skill Survey. This experience was a pointed reminder of the fact that the conditions under which an Area Skill Survey is conducted are subject to radical changes. Indeed, this method of acquiring manpower information is particularly vulnerable to the problem of unanticipated change in a labor market area because of the considerable length of time required to complete the whole procedure from advance planning through the survey proper and any follow-up. While the influence of these factors cannot be measured, they probably interfered with employer response in some instances.

## EVALUATION OF THE OCCUPATIONAL DATA OBTAINED IN THE LIGHT OF PROBLEMS ENCOUNTERED

The sampling problems encountered in the taking of the Milwaukee area Employer Needs Survey fall into two general categories, namely, those considered unique to this particular labor market area as reflected in the patterns of employer responses, and those arising from the use of the SIC structure as the basis for designing the sample. The following evaluation of the expanded occupational employment data obtained from the sample undertakes to analyze in detail the effect of these factors on the validity of the results of the Experimental Employer Needs Survey.

### SIC Structure and Sampling Design of Occupational Studies

The Standard Industrial Classification Manual classifies establishments by the type of activity in which they are engaged, using numerical categories of two, three, and four digits. This permits arrangement of statistical information according to the degree of detail desired. SIC codes have found wide application in a variety of economic studies and have been used in the presentation of employment data as well. In Wisconsin, for example, the Unemployment Compensation Division classifies employment for each county by SIC designations of four digits for manufacturing and by three digits for other industries. The result is a ready-made, easy-to-use, widely accepted sampling unit.

At first glance it would appear that such economic units would readily lend themselves to occupational studies, since some measure of homogeneity exists in each category. However, problems arise because of the nature of the criteria used in determining SIC units, and some of these became apparent in the course of PROJECT VISION's Experimental Employer Needs Survey.

The establishment-classification code is assigned in the SIC "on the basis of its [the establishment's] major activity, which is determined by the product or group of products produced or handled, or services rendered"[8] (emphasis is PROJECT VISION's). It is not a classification based on methods of production or processes used. In contrast, occupations and occupational patterns are determined by methods of manufacture or of rendering a service. PROJECT VISION analyzed several 2-digit SIC groups and several occupational skill levels where the occupational mix was thought to be such as to preclude obtaining usable data for preparing occupational trends. A detailed description of this undertaking follows.

## 1. Analysis of Selected SIC Groups

A comparison was made of the data derived from the Needs Survey with data from other sources such as the 1960 Census, employer associations, and labor organizations. Initially, a review was made of the occupational data at the 2-digit industry level. If no obvious distortions were observed, the industry was eliminated from further study. Since, as a result of this review, Contract Construction, Manufacturing, and Government appeared at this level to present specific problems, certain occupations within these groups were selected for further analysis. In several cases where the existing data -- thought to be reliable -- differed greatly from those obtained in the Experimental Employer Needs Survey, alternative methods of collecting the data are suggested. For comparative purposes, an analysis of the returns for the Electrical Machinery Equipment and Supplies industry (SIC 36) is presented.

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[8] SIC Manual, p. xi.

It is an example of the manner in which the review for a 2-digit SIC group can lead to the determination that the returns from the sample adequately represent the industry.

## Contract Construction -- SIC 15, 16, 17

The Contract Construction industry was included among the industries selected for study because of highly questionable data obtained on a key occupation, Carpenter. This led to an across-the-board analysis of

SIC 15 - Building Construction -- General Contractors
SIC 16 - Construction other than Building Construction -- General Contractors
SIC 17 - Special Trade Contractors

In general, Groups 15 and 16 offered few problems, since both groups are relatively homogeneous. Yet, in dealing with data obtained from such a sample, it must be remembered that there is variation in the work force of most general contractors because of seasonal factors which are well known, and also because of the contractual nature of their business. Many contractors specialize in certain segments of the industry and subcontract for all other operations such as carpentry, bricklaying, and excavating. Some firms having managerial and clerical staffs but no laborers or craftsmen are atypical. However, since they can be readily identified, adjustments can be made in the sample to minimize their effect on the final results.

In contrast to SIC 15 and 16, SIC 17 creates problems that can only be overcome by using alternate methods of obtaining occupational data. This group covers a number of specializations. Therefore, a sampling in proportion to each specialization must be made in order to develop accurate estimates of the total universe of individuals employed in the group. Application of a single expansion factor to the entire group leads to inaccuracies because of the range of specializations and the unrelated occupational patterns found in each area of specialization. A brief analysis of the problems encountered in this group follows.

Major SIC Group 17, Special Trade Contractors, consists of eight 3-digit trade groupings and a single miscellaneous group. Six of the eight were represented on the Employer Needs Survey questionnaire by corresponding occupational titles. The coded groups and occupations used were as follows:

| SIC CODE | TYPE OF CONTRACTOR | OCCUPATION | OCCUPATION CODE |
|---|---|---|---|
| 171 | Plumbing and Heating | Plumber | 862.381 |
| | | Steamfitter | 862.381 |
| 172 | Painting, Paper Hanging, and Decorating | Painter | 840.781 |
| 173 | Electrical Work | Electrician | 824.281 |
| 174 | Masonry Stone Work, Tile Setting and Plastering | Bricklayer | 861.381 |
| | | Plasterer | 842.781 |
| 175 | Carpentering and Floor Work | Carpenter | 860.781 |
| | | Floor Layer | 864.781 |
| 176 | Roof and Sheet Metal Worker | Roofer | 866.381 |
| | | Sheet Metal Worker | 804.281 |
| 177 | Concrete Work | Cement Finisher | 844.844 |
| 178 | Water Well Drilling | None | |
| 179 | Miscellaneous | None | |

While the survey questionnaire contained occupational titles representing nearly all of these 3-digit groups, the response rate varied between them and, therefore, limited the value of the data considerably. Only Groups 171, 173, and 176 were represented by employment data because employers failed to supply information on a number of important occupations, namely, plasterer, floor layer, roofer, painter, bricklayer, carpenter, and cement finisher. Approximately 80 percent of the responses in Major Group 17 were confined to Group 173, Electrical Work. Current employment in the Milwaukee SMSA for this occupation within the construction industry, as estimated on the basis of sample returns, was calculated to be 4,182. Upon reviewing other sources of data, such as the 1960 Census, and discussing the expanded data with the electricians' union, it became quite clear that the figure derived from the survey could not be valid. The electricians' union indicated that the current figure would probably be only half as large. The error was the direct result of the 2-digit SIC expansion factor.

These statistical problems in occupational data based on SIC 17 give a good indication of the magnitude and sources of error that can occur in using the 2-digit SIC expansion technique for the Construction industry. Further, the analysis seems to indicate that not only is sampling difficult but in some instances impossible because of the uneven response rate to a mail questionnaire survey. It is suggested that the best way to obtain occupational employment information for the construction trades is through communication with the various labor organizations. Certainly, occupational data obtained in this instance from the electrical workers' union yielded far more accurate results than the mail questionnaire survey with regard to current employment.

## Food and Kindred Products -- SIC 20

The Food and Kindred Products industry was included in the analysis of the SIC structure as it related to occupational sampling because of the broad coverage of products in the industry. These very diverse industries are classified together in the SIC only because they manufacture edible products. The many unrelated products in SIC 20 include meat products; dairy products; bakery products; canned and preserved fruits, vegetables, and sea foods; grain mill products; beverages, and miscellaneous food preparations and kindred products. Under each of these broad categories is a vast list of related products.

It is of interest that the type of error anticipated, namely, skewed weighting of occupations as a result of unique occupational patterns within the several food industries, did not materialize. Analysis revealed no evidence of sampling errors in SIC 20. It is believed that this resulted from the good response rate within each size category by 4-digit SIC. Problems relating to SIC structure might well have occurred if the response rate had been less adequate.

Other types of errors did surface, however, which can serve as indicators to the limits of accuracy in the results of an Employer Needs Survey based on a mail questionnaire. Misunderstandings concerning the data asked for were potentially serious, and it is possible that this would not have been revealed except for this special analysis. Some employers apparently thought that all of their personnel had to be accounted for. To accomplish this, they added their unskilled and semiskilled workers into the nearest appropriate skilled or semiskilled job classification on the prelisted occupational stub of the survey questionnaire.

## Government -- SIC 91, 92, 93

Government agencies are involved in nearly all functions performed by private industry. Accordingly, the SIC _Manual_ assigns a special coding system to them:

> The first two digits of the code number will be determined by the level of government operating the facility (major groups are: 91--Federal; 92--State; 93--Local; and 94--International). The last two digits shown represent the industrial activity on a Major Group basis (01-89).[9]

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[9] SIC _Manual_, p. 312.

Preliminary analysis of PROJECT VISION Employer Needs Survey data revealed several gross errors in occupational employment and projections in the Government category. Attention was directed to results from local government facilities because it was in these that distortions were particularly obvious. The following examples are presented for illustrative purposes. They leave no doubt that the use of the 2-digit SIC structure for sampling and expansion was quite unsatisfactory when applied to government agencies. The problem was further complicated by the lack of response from such large local government units as Milwaukee County and several school boards in the Milwaukee SMSA.

The local government agencies in the Milwaukee SMSA employed approximately 240 civil engineers at the time of the survey, as determined from interviews and available city, county, and town records. Yet, using standard expansion techniques, the survey sampling of local government units employing more than 250 employees resulted in an estimated 520 civil engineers to be on their payrolls. This error is primarily the result of expansion by 2-digit SIC rather than by 4-digit SIC. The school systems, with their poor response rate, were the chief culprits. They do not employ civil engineers, but in the expansion by 2-digit SIC their presence caused the number of civil engineers to be overestimated. The over-inflation was also due to the fact that the City of Milwaukee had more than five times as many civil engineers as the next largest responding government unit. As a result, the ratio of civil engineers to other municipal workers in the sample was relatively high. This ratio in turn was applied to all nonresponding units with 250 or more employees.

Another occupation, structural draftsman, was affected in the same manner. The estimated current employment for 1967 was 450, while the actual number was approximately 170. To pursue this example further, the major nonrespondents, Milwaukee County and several school boards, employed only a few engineers and draftsmen. However, using the standard procedure of expansion, the nonrespondents ended up with about 400 engineers and 200 draftsmen. Again, the error resulted from expanding the responding government units' reported employment to the universe by 2-digit SIC rather than four.

Some of the estimates for occupations such as policemen and firefighters, which were written in by the government agencies, were also subject to distortion. Policemen were included by the cities of Milwaukee and Port Washington; firemen only by Milwaukee. The ratio of policemen to the total number of municipal employees in Milwaukee was 1,750 to 9,970, or 18 percent of the employees.

The policemen in the city of Port Washington constituted only 6 percent of the municipal workers. Consequently, when the expansion factors were applied, the Milwaukee proportion of one policeman to 5.5 municipal workers heavily weighted the distribution and affected all local governments with 250 or more employees. In all, there were 19 local governments with payrolls of 250 or more employees and a total of 42,660 employees. Replies were received from four, employing 11,180. Therefore, in such occupations as policeman, fireman, and engineer the numbers were increased disproportionately because the sample for them was expanded using the base of other city governments as well as city and county schools. In the expansion of the sample for local governments employing 250 or more employees, the city of Milwaukee represented the Milwaukee County government and all large school districts, some of which employed firefighters and only a few of which employed any policemen. The estimates for policemen and firefighters currently employed in the Milwaukee SMSA were therefore considerably higher than the actual numbers employed in those occupations. For example, actual employment of firefighters was approximately 1,900 at the time of the survey -- that is, slightly over one-half of the estimated employment at that time of 3,240 resulting from expansion of the Employer Needs Survey data. Estimated employment figures for policemen were similarly distorted.

In conclusion, it can be said that employment in many occupations was expanded disproportionately in the government agencies. The expansion factors for local government, city and county, were half again as large as they should have been. The magnitude of the errors in the expansion results were caused by the inclusion of school systems in the Government SIC category. The school systems employ about one-third of all local government employees in the Milwaukee SMSA. Since the occupational distribution in schools is radically different from that in other government agencies, most occupations expanded to the universe in SIC 93 were in error except for clerical and administrative occupations. Four-digit breakouts are the most accurate means of sampling in this industry group, particularly when data on noninterindustry occupations such as teachers, policemen, and firefighters are requested on a questionnaire. For occupational studies, then, sampling and expansion of the Government SIC groups should be by four digits rather than two.

## Electrical Machinery, Equipment, and Supplies Industry -- SIC 36

The occupational data obtained in the Experimental Employer Needs Survey for SIC 36 offer a demonstration of an industry group sample at the 2-digit SIC level which is considered to be representative. This is true in spite of the fact that some employers in the group did not return the questionnaire. The manner in which the analysis of the data was developed is presented here to show the importance of carrying it to the 3- and 4-digit level before the overall adequacy of a 2-digit industry group can be fully established.

The Electrical Goods industry was represented by approximately 30 firms out of a total of 88 in the Milwaukee SMSA. The employment in these 30 firms totaled 26,153 out of 37,019 within the SIC 36 group. Thus, the sample represented 70.6 percent of the total employment, which is considered to be very respectable. However, the response was not as representative. Only 16 firms out of the 30 in the sample responded, representing only 11,230 employees or 31 percent of the total employment. Yet even this smaller percentage can be considered quite representative if the responding establishments fall within the proper SIC 3- and 4-digit codes. Accordingly, an analysis by activity characteristic of each 4-digit industry was made to determine their occupational distribution. The findings and conclusions follow.

1. Generally speaking, the occupations which were reported by the SIC 36 respondents were fairly representative of the 2-digit industry group as a whole.

2. Three of the SIC codes not represented in the survey were: 3623--Welding Apparatus; 3651--Radio and TV Receiving Sets; and 3694--Electrical Equipment for Combustion Engines. However, they had an employment distribution which was somewhat similar to firms in 4-digit groups from which responses were obtained: 3613--Switch Gear and Switchboard; 3622--Industrial Controls; 3634--Electrical Housewares; and 3679--Electronic Components, n.e.c. The firms that responded represented 44 percent of the total employment in all seven of these classes.

3. There was only one establishment in SIC 3639--Household Appliances, n.e.c. This establishment, with 2 percent of the SIC 36 employment, did not respond. However, the occupations in this firm were at skill levels lower than those covered in the survey.

4. Of the remaining SIC 36 groups from which no representation was obtained, each was found to have less than one-half of one percent of total SIC 36 employment in the Milwaukee area.

Additional analysis demonstrated that there were no major effects on the occupational distribution in the survey because of the nonresponding employers. Several employers engaged in the production of electronic equipment did not reply. As a result, several occupations were under-represented, mainly engineers and engineering technicians. However, since it is possible to identify occupations peculiar to a company and to identify a company with an unusually large number of people in certain occupations, adjustments can be made relatively easily. Although there was no representation from several 4-digit industries, occupations peculiar to those industries were not on the prelisted occupational stubs, and most of these industries had only a tiny percentage of total SIC 36 employment in the area. Therefore, in this survey a sample by 2-digit groups proved adequate for industry 36.

## 2. Critical Appraisal of SIC Structure as a Base for Occupational Sampling

Over and above the specific problems encountered in selected industry groups, PROJECT VISION's critical appraisal of the SIC structure as a tool for sampling occupations in a labor market area brought to light the need for a full discussion of certain fundamental difficulties which were found to interfere with the development of homogeneous occupational groupings suitable for study and educational programming purposes. Although these cannot be treated extensively in this report, it is hoped that calling attention to them here may lead to further research and practical solutions to some.

### Problems Can Exist Even at the 4-Digit SIC Level

Major Industry Group 25, Furniture and Fixtures, is an example of a classification in which establishments are coded by product regardless of manufacturing activities or material used. As a result, it combines woodworking, metalworking, plastic fabricating, and upholstering activities. This continues to be true in the 3-digit breakdowns. Most of the 4-digit groups divide into woodworking or metalworking units, but not all of them do. Group 2531, Public Building and Related Furniture,[10] for example, combines into one category various types of manufacture with dissimilar occupational patterns.

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[10] SIC Manual Definition of Public Building and Related Furniture: "Establishments primarily engaged in manufacturing furniture for schools, theaters, assembly halls, churches, and libraries. Establishments primarily engaged in manufacturing seats for public conveyances, as well as seats for automobiles and aircraft, are included in this industry. Establishments primarily engaged in manufacturing stone furniture are classified in Industry 3281, and concrete furniture in Industry 3272," p. 81.

Also at the 4-digit level in major group 25, some firms which rightly are classified in 4-digit groups which pertain to wood products have occupational patterns similar to those classified under some of the major group 24 codes, Lumber and Wood Products, except Furniture. Similarly, some establishments engaged in the manufacture of metal furniture are occupationally similar to establishments listed under some of the major group 34 codes, Fabricated Metal Products, except Ordnance, Machinery, and Transportation Equipment.

## Problems Inherent in the n.e.c. Category

Another characteristic of the SIC structure which results in occupationally heterogeneous 4-digit groups is the necessity of grouping many small, loosely related or unrelated economic activities into a single "miscellaneous" or n.e.c. (not elsewhere classified) category. Such categories invariably contain establishments with dissimilar occupational patterns which, therefore, do not lend themselves to sampling.

## Problems of Dispersal of Occupationally Alike Establishments

The economic orientation of the SIC classification not only groups occupationally dissimilar activities, but also tends to disperse establishments which are similar in occupation composition among many SIC groups. The examples of division of woodworking shops between major group 24 and major group 25 codes have already been noted. Another illustration covers the difficulties involved in the occupational patterns of gear manufacturing industries. Occupations in jobbing gear shops are quite similar, but such jobbers receive SIC classifications according to the end product in which the majority of their gears will be used. Consequently, gear shops may be divided between SIC codes 3566, 3714, 3721, or 3751, depending upon whether the gears will be sold to machinery, automobile, motorcycle, or aircraft manufacturers.

## Problems Relating to Composite Establishments

In addition to problems arising from the economic orientation of the SIC, there is a difficulty not directly related to the structure of the SIC. This involves the fact that many establishments are composites engaged in several industrial activities.

Ideally, such establishments in reporting their employment to the Wisconsin Unemployment Compensation Division, should break down their employment figures by activity or product. If this is done, Unemployment Compensation compilations will show employment of such establishments in several SIC categories, reflecting the various activities in which they are engaged. In the Milwaukee SMSA, however, establishments seldom make this type of employment breakdown. Most establishments simply list all employees under the industrial activity having the greatest dollar value of production or service rendered. As a result, many SIC categories include a considerable number of workers who are not actually engaged in activities of that category. For example, one large composite corporation lists all employment under combustion engine manufacturing, SIC 3519, which is its largest single division but has less than 50 percent of its production. This company is also the largest producer of locks in the area. Thus, a study of hardware or lock manufacturing (SIC 3429) using the SIC listings would omit this company. By the same token, an occupational study of combustion engine manufacturing, using SIC code 3519, would show that industry including many occupations, such as lock assemblers, which in reality are not used in combustion engine manufacture.

## 3. Conclusions and Recommendations

Most of the difficulties encountered by using the SIC structure as a system for gathering and presenting occupational information arise not from the nature of its structure but from the way it is used. It is obviously risky to apply any system to purposes other than those for which it was designed. In this case, the criteria for classification used by the SIC is excellent for economic studies but largely irrelevant for occupational studies. Too often, however, there is a tendency to use the SIC as a "bible" for every purpose, and to assume that all establishments listed in a given category have the appropriate degree of homogeneity, regardless of the nature of the information to be gathered or presented.

The findings of PROJECT VISION indicate that the present SIC structure can be used to study and present some occupations which are found to be fairly evenly distributed throughout the economy, such as clerical and some administrative occupations. In such cases, sampling or response errors are minor and offsetting factors are present. Real problems occur, however, when SIC groups are used for occupations limited to some segments of industry and unevenly distributed in a labor market area. Here, the SIC categories which group together establishments with dissimilar occupational patterns make sampling difficult and vulnerable to response errors.

This results in significant distortions in the universe as finally estimated.

Any suggestions that a traditional method of operation is not entirely adequate can meet with resistance, especially when this is done without presentation of alternate methods. Fortunately, it is possible to offer these other approaches to this problem for consideration:

a. As mentioned above, some occupations can be sampled using employment data organized according to the existing SIC structure. These are interindustry occupations evenly distributed throughout the economy. An occupational analyst can identify such occupations by analyzing available sources of occupational information such as returns from local Area Skill Surveys, local ES office reports, the BLS Occupation-by-Industry Matrix, and local ES office intelligence (a rich source of data, often not fully utilized).

b. In SMSA areas with populations of about 150,000 the industries of an area are usually so well known that trained and experienced people at the local Employment Service office level are able to group the establishments in categories in which all firms will have similar occupational patterns, and identify those which are unique and therefore should not be a part of any sample. These individuals will also be able to identify those firms engaged in multiple activities requiring a distribution of employment into various sampling groups. Studies in such areas, therefore, might best be conducted locally, with local experts permitted to disregard existing classification systems and use their own initiative.

c. In larger SMSA areas, the problem becomes more difficult. In large SMSA's, such as those with one million population, studies can be made by consulting business and manufacturing associations, classified telephone directories, and local Employment Service office employer records. In addition, local Employment Service office intelligence can be used to identify establishments engaged in any industrial activity under study and modify the Unemployment Compensation Division's listings of employment in establishments by SIC codes to form more adequate sampling groups. This was done experimentally by PROJECT VISION in an industry study of the Metal Casting Industry (see Chapter V). It took only a few hours to compile lists of establishments according to activity and similar occupational patterns rather than to end product, and to identify establishments which had captive operations. The intensive study which followed confirmed the accuracy of the lists so compiled. It must be recognized, however, that this was done by an occupational analyst who was familiar with the industrial complex under study.

d. The very large metropolitan areas such as Los Angeles, Chicago, New York or Philadelphia present greater problems. It is unlikely that local Employment Service office intelligence in such areas has sufficient knowledge of the entire economic complex to cope with them. There is a definite need under such circumstances for more research leading to the development of an industrial classification system which would group establishments by activities rather than by end product or result of service rendered. Establishments grouped by such criteria would have greater similarity in occupational composition.

It may be argued that available data are always presented by SIC codes and that, therefore, they must be used in their present form. However, this does not take into account what could be done. The SIC system has a degree of flexibility which permits conversion tables, easily handled by computer, to translate data into other systems. One or more digits can be added to regular SIC codes in order to obtain a breakdown of data to meet a special purpose. It is of interest to note here that the U.S. Department of Commerce, in its Census of Manufactures, publishes tables of product statistics along with the industry statistics for 4-digit SIC groups. The product statistics are identified by descriptive titles and by product codes that range up to seven digits. These codes include the appropriate 4-digit SIC's.

The present practice in Wisconsin is to use 4-digit SIC codes to classify manufacturing firms and 3-digit SIC codes to classify firms in other industries. This arrangement results in classification by industrial activity without reference to occupational patterns. Lists of establishments by SIC code are printed for use by the Unemployment Compensation Division of the Wisconsin

Department of Industry, Labor and Human Relations. For purposes of uniformity, these designations are used by other official agencies as well, and it is possible to introduce certain variations to meet particular purposes. When gathering occupational information, it is possible to assign the additional digits used by the U.S. Department of Commerce to SIC designations in areas where the regular 3- or 4-digit listing does not produce occupationally similar groupings. Such expanded data might then be used to produce lists of establishments arranged in a pattern more adaptable to occupational studies.

The problem of composite corporations can be solved by requesting overall breakdowns of employment by division or activity in the course of any survey or study. Samples could then be adjusted accordingly. In fact, Wisconsin Unemployment Compensation listings already do include more than one SIC code for some establishments, although this is limited to a few of the largest Milwaukee firms.

Thus, while at present there is no system for sampling occupational information other than the traditional application of the SIC, this does not mean that a more flexible and appropriate system could not be developed.

### Reasons for Employers' Failure to Respond to Employer Needs Survey Questionnaire

The validity achieved by a labor needs survey in providing projections of employment is dependent on both the accuracy of the responses and the number of responses received. In order to evaluate the important factors, PROJECT VISION undertook to approach both responding and nonresponding employers to determine the effects of certain problem areas on the accuracy achieved by such a survey. This section pertains to those employers who did not respond to the Milwaukee Experimental Employer Needs Survey and the reasons for their nonresponse. The analysis is based on the results of structured interviews with a limited selection of nonrespondents and a follow-up mail survey of 285 additional nonrespondents.

During the month of December 1967, PROJECT VISION representatives interviewed 40 nonresponding employers in the Milwaukee SMSA. This was approximately four months after the Needs Survey questionnaire was mailed to the employers. Employers were selected to represent all SIC groups containing a large skilled work force and limited rates of response. In addition, insofar as possible, employers were selected whose businesses were considered to be typical of their SIC groups in the Milwaukee SMSA. A breakdown of visits to nonrespondents by major SIC group and number of employees is given in Table 5 as follows:

TABLE 5.--Number of Employees in 40 Nonresponding Firms Interviewed and Number of Employees by Major SIC Industry Group

| MAJOR SIC INDUSTRY GROUP | Number of Firms Interviewed | Number of Firms by Number of Employees | | | | Number of Employees in Firms Interviewed |
|---|---|---|---|---|---|---|
| | | 1000 or more | 500-999 | 100-499 | 50-99 | |
| General Building Contractors | 2 | | | 2 | | 230 |
| Heavy Construction Contractors | 1 | | | 1 | | 172 |
| Food and Kindred Products | 3 | 2 | | 1 | | 4,205 |
| Rubber and Plastics Products, n.e.c. | 21 | 12 | 7 | 2 | | 37,532 |
| Railroad Transportation | 3 | 3 | | | | 5,892 |
| Wholesale Trade | 6 | 2 | 3 | 2 | 1 | 10,231 |
| Banking | 1 | | 1 | | | 588 |
| Government | 1 | | | 1 | | 272 |
| Totals | 40 | 19 | 11 | 9 | 1 | 59,122 |

A number of hypotheses were developed in an attempt to understand employer reaction to the survey and to characterize the nonresponding employers. The hypotheses can be divided into two groups: those dealing with basic conceptual questions involving the survey, such as the existence of manpower planning and the utilization of vocational education as a source of trained workers; and those dealing with problems more mechanical in nature relating to the gathering of necessary in-plant data in order to fill out the questionnaire.

### 1. Reasons Related to Manpower Planning and Utilization of Vocational Education

During the interviews, each firm was asked: "Does your company do manpower planning?" (see App. C, pp.C3-C14 for complete interview questionnaire.) It had been hypothesized that a major reason for failure to respond to the survey questionnaire was that little manpower planning was done in the establishment and therefore the data pertaining to future trends in the firm's employment pattern would not be available to the employer. In addition, because the expertise necessary to project occupational needs would probably be lacking, a poor response or no response would probably result.

The other basic question asked was: "Does your company inform local vocational educators of future skill needs?" The underlying hypothesis of this inquiry was that employers may not respond because of already existing contacts with educators, thus limiting their interest for completing a lengthy mail questionnaire. In such firms, communication with training institutions might at present be quite adequate with no need for the State Employment Service to be a third party to an on-going relationship.

In summary, the information obtained from the employers who were asked about the existence of manpower planning within their establishments indicated that very few of the nonresponding employers did any manpower planning; that of the five stating that they did such planning, only two made a serious attempt, and both of these seemed quite dissatisfied with the manpower projections produced thus far. The following paragraph describes the planning done by one of the firms interviewed:

> Manufacturer with more than 1,000 employees: Industrial Relations Manager related sales and financial forecasts to manpower plans. Projections are detailed by occupation for one year and by occupational groups for five years. Projections are made each year so that management can anticipate areas in which problems might arise. Such planning is used to develop training programs, plan recruitment, and to provide control of labor costs. Each month actual employment by occupation by department is compared with forecasts so that at the end of the year the firm is staffed at adequate levels.

The above example is the best effort found in manpower planning; yet even here detailed occupational projections were not attempted beyond one year. Thus, a lack of serious manpower planning efforts was characteristic of the firms interviewed.

The other inquiry concerned utilization of formal vocational education. Employers were asked whether their firms "inform local vocational educators of future skill needs." Nine of the 40 establishments answered "yes." All but one of these nine were large firms with at least 500 or 1,000 employees. However, the general impression given by these firms was that there was little interest on their part in keeping the schools informed of their skill needs. In some instances, the persons interviewed were clearly apathetic to the idea of regular communication with educators in spite of their extensive use of technical level manpower. Only two of the nine employers were in touch with vocational schools on a regular basis. The comments made by several employers seemed to imply that the real value of the vocational education system is its tremendous versatility. Employers seemed to favor the informal nature of the present system and apparently saw little or no need for a periodic exchange of information. From these comments it seemed evident that many of the establishments that did not respond to the survey failed to do so because an exchange of information with vocational educators was not thought to be altogether necessary.

### 2. Reasons Related to Gathering In-plant Data

The interviews were also intended to disclose more specific reasons as to why the questionnaires were not returned. The hypotheses in this phase of the study were based, in part, on employers' comments made during the pretest of the Needs Survey questionnaire as well as on problems raised by employers who responded during the survey itself. As a result, the interviews with nonrespondents covered the following items:

> Questionnaire design. The hypothesis was that many employers would refuse to respond on the grounds that the lists of occupational titles and the format of the questionnaire were too complex and/or lengthy.

Only three representatives of the 40 establishments interviewed stated that this was their primary reason for not responding. These establishments centered their criticism largely on the request for an age and sex breakdown of current employment. This particular criticism, although a reflection of questionnaire design, is probably also influenced by cost considerations. Consequently, this hypothesis concerning the overall questionnaire design did not appear to be of significance in determining the degree of response to the area Needs Survey. Nevertheless, possible defects in questionnaire design are clearly implied in the problems identified in the two following items. Each of these defects is judged to be so significant that they are discussed separately.

> Difficulty in making projections. This hypothesis stated that nonresponse to the area Needs Survey was the result of difficulties experienced by employers in making long-range manpower utilization projections.

It became evident during the pretest in the planning stage of PROJECT VISION that employers had serious reservations about their ability to make 3- and 5-year employee-needs projections for specific occupations. It could be expected, therefore, that this difficulty might well be the most commonly stated reason for nonresponse.

Of 40 employers interviewed, 12 stated that this was their primary reason for not responding to the survey. Often, these difficulties were exhibited as lack of confidence in the accuracy of their projections. A major factor in their lack of confidence was the period of time over which the projections were to extend. Several employers asserted that if asked to make such projections over a shorter time interval, they would be more likely to cooperate. The probable explanation for this preference is the existence of a number of other types of projections for plant activities made for shorter time intervals. Most employers prefer to make an occupational projection for one year since this coincides with the usual sales and production forecast period. As a result of this inquiry, it must be recognized that forward projections of as much as three and five years were an important factor in an employer's reluctance to answer the original questionnaire.

> Too costly, too time-consuming. This hypothesis specified that time and costs involved in completing PROJECT VISION's questionnaire were related factors limiting response.

During the pretest period a number of employers had suggested that the data being considered for inclusion on the questionnaire would be too costly for their firm to assemble. In this follow-up of the actual survey, 12 of 40 employers interviewed gave this as their major reason for not responding to the area Needs Survey. It should be pointed out also that nearly all of the employers who cited difficulty in making manpower projections as their primary reason for nonresponse listed the costs involved as a secondary reason. Thus, consideration of cost and time expenditures was associated particularly with the task of determining manpower projections. In summary, it seems likely that for 24 of the 40 employers interviewed their failure to respond was based on the fact that the time and costs which would be incurred to prepare the required projections could not be justified. It is hoped that as the concept of manpower planning receives increased emphasis in the future, this type of difficulty will come to have a less restrictive effect on employer response patterns.

Company policy on answering questionnaire
Confidential nature of data requested
Company policy on releasing information to WSES

> This hypothesis stated that employers did not respond to the questionnaire because of company policies governing release of information to an outsider.

The following reasons had already been expressed by some employers prior to the nonresponse study as important factors for not answering the questionnaire:

> It was company policy not to answer questionnaires unless required to do so by law.
>
> The confidential nature of the information being requested would make them unwilling to respond.
>
> It was suggested by an economist working on a related project that some employers would not be willing to release employment figures to WSES, but that they would probably be willing to release them to the school authorities.

When the formal follow-up interviews were held, little evidence accrued to support this hypothesis. Only three of the 40 employers cited any one of the above reasons as their explanation for not responding to the survey. One of the three stated that this type of information was confidential, and the other two revealed that it was company policy not to respond to questionnaires not required by law. Thus, only three of the 40 employers in the post-survey had simply refused to cooperate with the PROJECT VISION mail questionnaire survey. It should be noted that almost without exception there was a friendly and cooperative attitude on the part of employers interviewed in this follow-up study.

In addition to the preceding hypothesis, two other factors deserve emphasis because they were commented on frequently during interviews. The comments indicated that employers felt that the information requested was not applicable to them and, likewise, that the collection of the data requested would be extremely difficult because of the structure of their organization. Each of these reasons was cited by five employers as an important reason for nonresponse. Apparently these factors entered into the thinking of other nonrespondents as well even if they did not appear as decisive factors. However, of particular interest as a result of this analysis is the belief by PROJECT VISION that these employers seemed to be saying that the relevance of the questionnaire, and hence its applicability to them, is really dependent on the extent to which company policy allows for the utilization of vocationally trained individuals. It becomes self-evident that the value of vocational education is all but eliminated if the firms employ large numbers of unskilled workers or if restrictions placed on the level at which persons may enter into employment with the firm negate vocational education preparation.

### 3. Conclusions

The exploration of reasons for employers' inactivity in regard to the Experimental Employer Needs Survey emphasized the importance of several factors -- cost, time, difficulty in providing certain data (particularly long-range occupational needs projections), and inability to see the relevance of the survey results -- in limiting the response. These interviews with nonrespondents lead to the general conclusion that the task of making occupational projections is an extremely difficult and time-consuming venture and that most personnel managers, especially those in large plants, have neither the time nor the expertise to tackle such a job. The matter of expertise is, quite often, a reflection of the time factor because the persons making the projections find it necessary to discuss the projections with various department heads in order to ensure the greatest possible degree of accuracy. Thus, valuable supervisory time must be counted in the cost. These interviews indicated, further, that few of the nonresponding firms inform vocational educators of future skill needs, and fewer still have attempted manpower planning.

## SPECIAL FOLLOW-UP SURVEY OF SELECTED EMPLOYERS

An additional number of nonrespondents were the subject of a follow-up mail survey designed to solicit additional information on manpower planning, recruitment, and the employment of vocational education graduates. Information obtained in the nonresponse interview study and from unsolicited letters from nonrespondents had led to the belief that further inquiry into these particular areas would result in greater insight into employers' attitudes about the Employer Needs Survey. A brief questionnaire (App. D, p. D3) was mailed to 285 nonresponding firms, ranging in size from 50 to more than 500 employees. These establishments comprised nearly one-half of the 583 which had not responded to the original questionnaires. Table 6 gives the distribution by size and major SIC industry group of all establishments included in this mail survey and of the 147 establishments that answered.

TABLE 6.--Number of Establishments Included in Follow-up Mail Survey and Number Responding by Major SIC Industry Group and Size of Establishment

| Major SIC Industry Group | SIC Code | Number of Employees 50-100 T | R | 101-150 T | R | 151-300 T | R | 301-500 T | R | No. of Establishments Surveyed T | R | Percent Responding |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Construction | 15-17 | 4 | 2 | 5 | 3 | 7 | 4 | 1 | 1 | 17 | 10 | 58.8 |
| Manufacturing | 19-39 | 9 | 5 | 36 | 17 | 47 | 28 | 22 | 10 | 114 | 60 | 52.6 |
| Utilities | 40-49 | 4 | 3 | 10 | 6 | 7 | 4 | 1 | 1 | 22 | 14 | 63.6 |
| Wholesale & retail trade | 50-59 | 25 | 8 | 25 | 11 | 13 | 6 | 6 | 3 | 69 | 28 | 40.6 |
| Finance | 60-67 | 6 | 4 | 5 | 3 | 8 | 4 | 2 | 2 | 21 | 13 | 61.9 |
| Service | 70-89 | 9 | 5 | 19 | 10 | 11 | 5 | 3 | 2 | 42 | 22 | 52.4 |
| Total |  | 57 | 27 | 100 | 50 | 93 | 51 | 35 | 19 | 285 | 147 | 51.6 |

T: Total number of firms included in follow-up mail survey.
R: Firms responding to follow-up questionnaire.

### External and Internal Labor Market Conditions

Through this follow-up mail survey, an effort was made to examine the relationship of the following four conditions to an employer's ability and willingness to respond to a mail Employer Needs Survey:

1. An employer's overall labor market and recruiting activity.
2. The existence of skill shortage conditions within the labor market and the firm.
3. The utilization of available vocational school graduates to alleviate such skill shortages.
4. The effect of union shop conditions on the number and type of "port-of-entry" positions (the hiring-in jobs) and the necessary relationships to OJT programs.

## 1. External Labor Market Conditions

The influence of the external conditions (Nos. 1-3 above) had become apparent during interviews with many of the large employers who had responded to the Employer Needs Survey. As a result, it was hypothesized that employers who answered affirmatively when questioned regarding external labor market conditions could also be expected to respond to a local mail skill survey. These were the employers who were active in the labor market, had experienced a skill shortage, and who utilized vocational school graduates. Therefore, since the employers included in the follow-up mail survey had not responded to the Employer Needs Survey, it might be assumed that the opposite of the above conditions would be true for their firms, namely, that they were not active in the labor market, that they had not experienced a skill shortage, and that they had not utilized vocational school graduates.

When the results of the follow-up mail survey were analyzed, the most surprising finding occurred in connection with the factor of the existence of skill shortages. Of the 147 employers who answered the follow-up survey, 74 percent replied they had experienced skill shortages in recent years. This percentage seemed extremely large, especially since the initial Employer Needs Survey questionnaire had been accompanied by a letter which emphasized the problem of skill shortages. The letter began:

> Do you know where you are going to obtain skilled workers in the next five years? This same uncertainty also confronts hundreds of other local employers . . . . In order to help executives facing this problem, a special study of manpower needs . . . .

There could be little doubt as to the intent of the Employer Needs Survey. In spite of this, a large percentage of nonresponding employers were faced with a crucial shortage situation. What efforts had they made to alleviate their labor shortage problem?

In the mail follow-up, employers with skilled labor shortages were asked to check their use of selected recruitment methods. Table 7 lists their responses in order of preference:

TABLE 7.--Proportion of 109 Employers Using Selected Recruitment Methods*

| Type of Recruitment Method Used | Percentage of Employers Using Recruitment Method |
|---|---|
| Newspaper advertisements | 93 |
| Employment agencies | 59 |
| Recruitment outside of area | 38 |
| Company training programs | 38 |
| Government and other agency training programs | 16 |

*Of the 147 respondents to the follow-up questionnaire, 109 employers indicated the type of recruitment used. Percentages are not additive since some employers used more than one method.

The employers' recruiting preferences are not really surprising. However, the fact that only 16 percent of the firms indicated government financed and other types of training programs as one means of alleviating skill shortages did raise some doubt as to the reliability of the response to this section. It can only be concluded that some factors other than the shortage of workers must play a decisive role in influencing an employer's decision to respond to an Area Skill Survey.

A more general area of investigation involved the employers' overall labor market and recruiting activity. It was hoped that it could lead to some judgment as to how active a role the nonresponding employers assumed in respect to labor market conditions. Therefore, in the follow-up mail survey, each employer was asked whether he had at any time "attempted to determine the availability of skilled or semiskilled workers in the local labor market." A total of 60 of the 147 employers, or 41 percent, answered "yes." Since it was assumed that an affirmative answer to this question implied an active role in the labor market, it was somewhat surprising to find so many "yes" answers among employers who had not responded to the Employer Needs Survey. In an effort to confirm these answers, the recruitment methods used by those who answered "yes" (supposedly, the active employers) were compared with those who answered "no" (supposedly, the inactive employers). Since recruitment involves activity in the labor market, it was anticipated that the recruitmethods used by the two types of employers would vary. The following table shows the percentage of employers using each of several methods to alleviate their skill shortages:

TABLE 8.--Percentage Distribution of Active and Inactive Employers Using Each Type of Recruitment Method

| Type of Recruitment Method | Active Employers Percent | Inactive Employers Percent |
|---|---|---|
| Recruitment outside the Milwaukee area | 41 | 26 |
| Recruitment through employment agencies | 66 | 40 |
| Use of newspaper advertisements | 82 | 92 |
| Training programs financed by company | 36 | 36 |
| Training programs financed by government | 24 | 22 |

Note: Percentages are not additive since employers were encouraged to check all methods used. A total of 109 employers answered these questions; 60 were in the Active group; 49 were in the Inactive group.

In comparison with the inactive group, the employers considered to be active in the labor market did show a greater tendency to use more aggressive recruitment methods. The relatively larger percentages who did outside recruiting and used employment agencies, and the somewhat smaller percentage using newspaper advertisements to meet manpower needs demonstrate this. These variations tended to confirm the evidence that a sizable number of nonrespondents were active in the labor market. Apparently, then, their decision not to respond to the mail Employer Needs Survey was based on other factors. This finding was contrary to the hypothesis concerning the influence of external labor market conditions on nonresponse.

The third condition listed under external labor market involved the utilization of vocational schools by area employers. Use of such facilities was defined as the hiring of graduates and the communicating of future skill needs to vocational educators. In the mail follow-up survey, the following relevant questions were asked:

> In the last year, have you hired
>
> Graduates of the Milwaukee School of Engineers (MSOE)?
> Graduates of Milwaukee, Vocational, Technical, and Adult Schools?
>
> In the last year have you been in touch with the Milwaukee area vocational schools about your training needs?

It had been hypothesized that firms utilizing vocational schools would be more likely to cooperate in an Area Skill Survey. Of 147 employers responding to the mail follow-up, 57 of them, or 39 percent, stated they hired vocational school graduates; 42 employers, or 28 percent, said they had been in touch with the vocational schools. Significantly, only 28 employers (19 percent) answered both questions affirmatively. This figure is perhaps the best measure of the extent to which this group of employers utilizes vocational schools.

The above findings indicate that, in spite of existing tight labor market conditions, few of the nonresponding employers made extensive use of vocational institutions. The reasons for this were explored by asking employers who did not hire vocational school graduates to check one of the following reasons for not doing so:

1. No training is offered for your skill needs.
2. Company was not hiring last year.
3. Company training satisfied skill needs.
4. Skill needs satisfied by another source.

Employers checked Numbers 1 and 3 most often. These two reasons may be complementary since, if no institutional training were offered, employers would satisfy their skill needs with their own in-plant training. However, in only a few cases did the same employer check both reasons, indicating that company training was not simply a response to the lack of appropriate institutional training.

## 2. The Internal Labor Market

As an administrative unit within an organization, the internal labor market has a set of institutional rules which delineate its boundaries and its structure. Such rules must also have significant influence on factors involved in a response or nonresponse to a mail skill survey questionnaire. The aspect of the internal labor market which bears on the response to an Area Skill Survey is the manner of employee admission to the internal market (see Condition No. 4, p. 69).

Admission to the internal labor market is based upon the existence of one or more "ports-of-entry" and the possession by the applicant of certain qualifications or selection criteria which are usually established for entry. In turn, of course, these entry specifications are a function of such variables as job content, relationship with the internal job structure, and the external availability of skills in the labor market area. This structuring of the internal labor market has fostered institutional forces which impinge on its operation. These forces are custom, union organization, and managerial procedures. Basically, the effect such forces have on ports-of-entry positions was the subject of inquiry.

With this in mind, the following questions were included in the follow-up mail survey of nonrespondents:

> Is entrance into employment with your firm mainly confined to entry at the bottom of existing seniority units or promotion ladders (except in the case of white-collar positions)?
>
> If "yes," does such a policy necessitate on-the-job training?

Of the 147 responding employers, 87 (59 percent) said they did adhere to a policy that required entry into employment with their firm to begin at the bottom of the internal job structure. The affirmative responses were quite equally distributed throughout the industrial structure. Of the 87 employers, 69 also stated that such a policy necessitated some form of on-the-job training programs. In many instances, the on-the-job training programs were rather loosely defined. However, the responses did indicate an awareness on the part of many employers of the value of "work-career" employment which encourages stronger ties to the firm.

The existence of policies requiring entry at the bottom of the establishment structure and necessitating on-the-job training programs could definitely limit the utilization of vocational schools by employers. This is true even if such policies are undertaken as a result of institutional factors (custom, union organization, managerial procedures) rather than for reasons relating more directly to job content, availability of skills, etc. Therefore, these policies are likely to affect an employer's willingness to respond to a mail skill survey questionnaire since the survey's results may not have an apparent applicability to his employment situation.

## 3. Conclusions

A number of factors thought to be of significance in determining an employer's ability and willingness to respond to the Employer Needs Survey questionnaire have been examined. Since this investigation merely involved "yes" and "no" answers to a brief mail questionnaire, the data are of course limited. The results indicate, however, that certain factors such as existing labor market conditions, the availability of vocational education, or the extent to which an employer is active in the labor market did not necessarily affect the employer's decision to cooperate in an Employer Needs Survey. However, it would obviously be helpful to investigate further the effect of institutional factors within the internal labor market in limiting the number and types of entry positions. This should provide additional insight into the extent to which vocational education can serve local labor needs. Further efforts should be made to identify "ports-of-entry" positions and their significance as they relate to "work-career" employment.

In general, the findings of the follow-up mail survey tended to reinforce those from the interview study which indicated that the most obvious factors limiting response were difficulties in making manpower projections, and problems of cost and time involved in completing a complex survey questionnaire. Certainly, a large number of firms which did not respond to the original mail questionnaire were later willing to respond promptly to the follow-up questionnaire--a brief, short-answer form which required no manpower projections. In view of the generally cooperative attitude found among nonrespondents, it is possible that the problem of nonresponse is more a matter of inability to complete a complicated skill survey questionnaire than unwillingness. It is likely that until employers are able to project their manpower needs with confidence and efficiency, the request for long, forward manpower projections by occupation will continue to limit the number who respond.

Finally, both phases of the nonresponse study indicate that the effort to sell the skill survey as a method of gaining information for vocational training programs may well fall on deaf ears if those ears belong to employers whose companies have policies which do not in reality allow for utilization of vocationally trained individuals.

## FACTORS INFLUENCING RESPONDENTS' OCCUPATIONAL PROJECTIONS

The Experimental Employer Needs Survey approach is based on the premise that selected employers in a community are willing and able to make detailed occupational projections for their firms at the request of a government agency. It is assumed that the average employer will have at his fingertips information not available elsewhere. Furthermore, it is anticipated that information collected from employers included in such a survey will reflect conditions in the local labor market area in a manner to be of potential value to local vocational educators and other training agencies. Obviously, if this technique proved to be feasible and reliable, it would provide a useful method for estimating future local area manpower needs in selected occupations.

Basic to the acceptance of an Employer Needs Survey as a reliable tool is an affirmative answer or judgment as to the average employer's ability and willingness to make long-range occupational projections in the context of an Employer Needs Survey. PROJECT VISION's mandate did not provide for appraising the results of the experimental survey at the end of the 3- and 5-year projection period on which the estimated future employment needs were based. PROJECT VISION, however, did undertake to make a judgment based on its experience in the conduct of the actual experimental survey in the Milwaukee SMSA and on the answers received in subsequent in-depth interviews with 127 of the employers who responded to the August 1967 survey.[11] It also took into account the problems, objections, and suggestions of those persons who actually conducted the survey, in the belief that such firsthand expertise is too frequently bypassed in the preparation of evaluations of standard methodologies.

It must be remembered that all employers included in the 1967 Experimental Employer Needs Survey received identical instructions and questions with regard to occupational projections for 1970 and 1972.[12] The relevant portions of the survey questionnaire are presented below. Note that the instructions include a list of assumptions to be made when determining future estimated employment by occupation.

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[11] Reliance was also placed on the results of interviews by PROJECT VISION representatives with 40 nonresponding employers. A complete nonresponse analysis is presented in the preceding section. Copies of interview questionnaires are found in Appendix C.

> INSTRUCTIONS FOR PREPARING PART II OF THE MANPOWER NEEDS SURVEY
>
> C. Current Employment. Enter in this column the
>
> D. Future Employment. For each occupation enter your estimates of the total number of workers you will require three and five years from now. In making your estimates please assume the following conditions:
>
> 1. Qualified workers will be available to meet anticipated employment demands.
> 2. The economic conditions that have existed for the past several years will continue through 1972.
> 3. Scientific and technological advances will continue, affecting industrial production methods, manpower requirements, and consumption patterns.
> 4. The present day normal workweek at your firm will continue through the forecast period.
> 5. Your current plans for plant expansion or modernization will materialize according to schedule.
>
> QUESTIONNAIRE FORMAT:

| CODE | OCCUPATIONAL TITLE | CURRENT EMPLOYMENT | ANTICIPATED EMPLOYMENT | | REPLACEMENT NEEDS DURING | WORKERS COMPLETING COMPANY TRAINING IN | |
|---|---|---|---|---|---|---|---|
| | | | 1970 | 1972 | 1968 | 1970 | 1972 |
| | | | | | | | |

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[12] Sample instruction sheets and survey questionnaires are found in Appendix B.

Much of the commentary in the following paragraphs resulted from extensive employer interviews and consultation with experts in the field of labor economics in the attempt to select factors that have bearing on the feasibility of eliciting reliable occupational projections from employers via the Experimental Employer Needs Survey technique.

## 1. Expertise of Persons Preparing the Projections

Interviews revealed that in companies large enough to have an organized personnel department the personnel manager or employment manager was usually made responsible for completing the questionnaire. In fact, in most cases he made the occupational projections himself. The data on current employment were usually filled in by the clerical staff. The selection of personnel departments for this task was natural because they have access to company-wide personnel records and are normally assigned the task of completing Employment Service survey questionnaires.

In firms with 100 or more employees, when the personnel department did not have responsibility for completing the questionnaire an executive of equal stature, such as the vice president, controller or office manager, performed the task. In some cases, when a plant was separated by several blocks from the administrative office or headquarters of the firm, mistakes sometimes appeared in the occupational classification of workers because the person answering the questionnaire was unfamiliar with the shop. In general, however, the expertise of the person selected to complete the form was thought to be adequate for the large firms. In smaller companies not having personnel departments, the president, vice president, controller or office manager performed the task. In a very few instances a clerk-typist did the entire job.

Thus, it is generally the personnel expert in the large firm or a top executive in the smaller firm who has the responsibility for making occupational projections. Moreover, it is of interest that nearly 60 percent of the 94 large employers[13] interviewed had consulted department heads in the process of preparing their projections. In some cases a top management meeting was held. In general, then, the task of making manpower projections was performed by upper echelon persons. It can be stated with assurance that the problems encountered in making projections were not related to the caliber of the persons who undertook their preparation.

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[13] Representing firms with 100 or more employees.

## 2. Relevant Factors Considered by Firms in Preparing the Occupational Projections

Many of the 127 respondents in this special interview study stated that they considered new technology in answering the August 1967 mail questionnaire. In contrast, among nonresponding firms, a number of representatives of technologically advanced companies mentioned that they did not have access to new technological developments at the time the survey form was received. As a result, PROJECT VISION received the impression that very advanced new products were not considered as a factor in the future estimates of employment, but that ordinary improvements in products and changes in manufacturing procedures seemed to be known to the respondents and were taken into account. This variation is understandable and can be expected in any survey of this nature.

The degree to which changing technology or work in process was considered is, however, somewhat open to question. Although the vast majority of employers (95 percent of 127 respondents) or their representatives said they considered these factors, a number mentioned that their jobs rarely took them to the shop. In fact, one employment manager said he was amazed to see a whole row of new machines in the shop when preparing the report even though the machines had been installed the previous year. (Incidentally, he was quite confident of his ability to make occupational projections.)

In conclusion, it can be presumed that most employers answering Employer Needs Surveys will attempt to consider relevant factors affecting future skills. However, the validity of their projections can only be determined later on the basis of the firm's actual employment at the end of the projection period. (At that time the effect of factors beyond the employer's control, such as the economic situation that prevailed during the forecast period, must be allowed for.)

## 3. Manpower Planning in Relation to Occupational Projections

Manpower planning applies the process of organization planning to the preparation and employment of human resources for productive purposes. At the corporate level, it is the process by which a firm conducts advanced recruitment and puts into operation training programs, retirement, promotional and other manpower policies, for the most part based on some type of manpower forecast. Because manpower planning must be integrated with overall organizational plans, it is in essence a management-directed, company-wide activity. Organizational components and staff departments are expected to formulate and implement their individual plans so that they harmonize with the corporate plan.[14]

## Extent of Planning

For some time now, interest has been centered on the extent to which the average firm is involved in manpower planning. Many State Employment Service personnel meeting with employers have maintained that few do such planning; others think it more prevalent. An appraisal of the adequacy of the August 1967 survey must take into account the effect which this type of planning would have on the projections of employer needs determined from that survey.

Analysts for PROJECT VISION were aware of the negative findings that appeared in an article in July 1961 by Robert Ferber and others, "Employers' Forecasts of Manpower: An Interview Study."[15] Also of particular interest was a 1967 study on manpower planning in Milwaukee by Richard Perlman. He concluded:

> Current manpower forecasts conducted by Milwaukee firms provide little help to agencies collecting forecasting data on firms to include in a sample of forecasters. Further they do not follow a pattern of procedures leading to accurate forecasting that can be recommended for use by other firms and areas.[16]

As a result of the above opinions, it was decided to attempt to learn how employers engaged in any kind of manpower planning for technical, skilled, and semiskilled occupations reacted to PROJECT VISION's Experimental Employer Needs Survey. Every employer interviewed in the follow-up study of respondents was asked whether his firm did manpower planning and, if so, to answer seven questions on his planning efforts. Although the chief concern was not with his planning for top management positions, which is stressed in some large corporations, the rationale given for executive manpower planning and its implications for planning for technical, skilled, and semiskilled occupations was found to be of interest (see Interview Questionnaire, App. C, pp. C5-C6).

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[14] Frank H. Cassell, "Manpower Planning: The Basic Policies," Personnel (Nov./Dec. 1965), 42, pp. 55-61.

[15] Robert Ferber, Nai-Ruenn Chen, and Fadil Zuwaylif, "Employers' Forecasts of Manpower: An Interview Study," J. of Business (July 1961), 387-395.

[16] Richard Perlman, Assessing the Extent of Manpower Forecasting Among Milwaukee Firms (Center for Studies in Vocational and Technical Education, University of Wisconsin, March 1969), p. 41.

Representatives of 127 firms responding to the August 1967 survey were interviewed, 21 of which were found to have a manpower planning program.[17] Table 9 (p. 81) provides a profile of these 21 responding firms. It is noted that some of them failed to supply data on projections even though they engaged in manpower planning.

The interviews established that manpower planning undertaken in the Milwaukee SMSA in the winter of 1967 did not provide the hoped-for basis for long-range projections. Furthermore, in response to questions regarding confidence in their projections, only two employers were confident of forward estimates beyond one year. In fact, most employers did not plan in detail beyond one year; even the few who did had little confidence in their efforts.

Various reasons were given for this skepticism. Some pointed to changing sales forecasts and projected product mix as reasons for unreliable results; others mentioned climate, technological change, etc. No pattern was found to characterize the type of firm doing manpower planning, although in general such firms seemed to have progressive personnel management policies. Many technologically advanced firms were found to plan ahead to meet manpower requirements. Some firms had tried such planning and had abandoned it. Little anxiety was noticed concerning the skill shortages a firm may have experienced; it was rationalized that the personnel department was not to blame if labor shortages developed because sales forecasts had changed unpredictably.

It was found that firms who did manpower planning spent considerable time in the undertaking because to obtain reasonable results

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[17] This proportion, 16.5 percent, was not appreciably higher than that found among the 40 nonrespondents interviewed in a separate follow-up study. In that group five, or 12.5 percent, did some planning.

TABLE 9.--Characteristics of Manpower Planning Programs in 21 Responding Firms

| Major SIC Group | Number of Employees | Persons Responsible for Plans | Plans Based On | Projection Period Year(s) | Frequency | Plans by Occupation | Plans by Overall Employment |
|---|---|---|---|---|---|---|---|
| 24 | 115 | Controller | Sales | 1 | Yearly | X | |
| 25 | 658 | Controller | Sales & Prod. | 1 | Yearly | X | |
| 26* | 445 | Office & Personnel Mgr. | Sales & Tech. Change | 1 | Yearly | X | |
| 27 | 270 | Personnel Manager | Sales | 1 | Yearly | X | |
| 27 | 124 | Controller | Sales | 1 | Yearly | X | |
| 35 | 2400 | Coordinating Committee | Sales | 1 & 5 | Yearly | X (1 yr.) | X (5 yr.) |
| 35 | 149 | Executive Vice Pres. | Sales | 5 | Yearly | X | |
| 35* | 1607 | President | Sales | 1 | Yearly | X | |
| 35 | 983 | Mgr. Planning & Mktg. | Sales | 1 & 3 | Yearly | X | X |
| 34* | 1100 | Coop. Team | Sales | 1 & 3 | Yearly | X** | X |
| 36* | 2886 | Department Heads | Sales | 1 & 3 | No Reg. Basis | X** | X |
| 39 | 138 | Controller | Sales | 1 | Yearly | X | |
| 42 | 132 | Planning Director | Sales | 1 & 10 | Yearly | X** | X |
| 50 | 39 | Manager & Foreman | Sales | 1 | Yearly | | X |
| 50 | 475 | Department Heads | Sales | 1 | Yearly | X | |
| 50 | 266 | Department Heads | Sales | 1, 5, 10 & 15 | Yearly | X | X |
| 53 | 1800 | Coordinating Committee | Sales | 1 | *** | X | |
| 62 | 180 | Manager | Company growth | 1 | Yearly | | X |
| 62 | 167 | Manager | Volume of Stock Exchange | 1 | Yearly | | X |
| 63 | 855 | Coordinating Committee | Sales | 1 to 3 | No Reg. Basis | X | |
| 93* | 9970 | Budget & Pers. Director | Population Growth | 1 | Yearly | X | |

*Firm provided no projection data to survey.

**Management position only.

***When "new store planned."

all planning functions -- sales, engineering, financial, manpower -- had to be coordinated into one package. However, in the view of those interviewed, few had attained the degree of accuracy they had been seeking.

PROJECT VISION came to the conclusion that the type of manpower planning undertaken during 1967 and 1968 in the Milwaukee area for nonexecutive occupations was not geared to generate data for long-range projections for occupational skill surveys. Neither in detail, projection period, nor scope was such planning an adequate base upon which to pin hope for reliable projections in the future. In addition, many large manufacturing firms did not do any manpower planning; with the many variables involved, they considered it impossible.

### Sales Forecast as a Basis for Manpower Planning

On the basis of the preceding analysis, it can be concluded that basic data on projections received in the August 1967 Milwaukee SMSA Experimental Employer Needs Survey was not compiled in a very scientific manner at the source. Forewarned about this problem by Perlman,[18] responding firms in the special interview follow-up study were asked: "Were your projections based primarily on changes in sales? If not, on what (if anything)?" These questions were asked in an effort to determine to what extent the personnel department used sales forecasts as the basis for manpower forecasts. Of the 109 employers interviewed who made projections, 88 calculated their estimates primarily on the basis of sales forecasts. Another 28 based their projections on expected building expansion, growth in the economy, past employment trends, increased plant capacity, or new product lines (which in turn depend in some measure on sales forecasts). Comments of some employers indicated a lack of enthusiasm concerning the accuracy of forecasts based on sales forecasts. This reaction was especially prevalent among nonrespondents in the special interview study.

Subsequent conversations with market research personnel indicated that sales forecasts beyond one year are not as detailed and accurate as might be expected. Comments in a text for marketing personnel by the American Management Association express their opinions concisely:

> The fact that their techniques are not scientific is a matter of academic interest to most marketing research practitioners. They are too busy applying the techniques to the solution of management problems to have much time left for controversy over definitions. The methods in use in marketing research

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[18] *Ibid.*, p. 79.

> today have met and passed the test of practicability. They are not "scientific," and they do not pretend to be. They have some advantages and limitations. They are widely used because they have--under the circumstances existing in marketing practices today--advantages that outweigh their limitations.[19]

In another chapter the author describes the types and purposes of short- and medium-range sales forecasts:

> In most companies, a very short-range forecast is required for planning production . . . . In many companies it is merely a reflection of the order book. In others, it is largely predicated on current sales levels, dealers' stocks, the companies own inventory policies, seasonal factors, and the like . . . .[20]

And further:

> Another type used in many companies is the middle range forecast. The exact period may vary, but it will begin at least two years in the future and may extend as many as five years ahead. I have serious doubts regarding the value and validity of this kind of forecast: I question whether it is possible to forecast cyclical movements three or five years ahead. In any case, I feel that such a forecast should have little detail and should be regarded as rather tentative and should be used chiefly as a basis for their timing of moves.[21]

The above statements emphasize that 3- and 5-year manpower forecasts cannot be assumed to be founded on a very scientific base. Sales forecasts for three and five years are not detailed or accurate enough to serve as a basis for detailed occupational projections. Manpower forecasts on such a basis must be considered, therefore, more in terms of opinions rather than systematic, scientific methodology. This, of course, does not mean that they have no value--only that the exactness of the forecast is not to be taken too seriously. Like all projections or forecasts, they are of value in estimating directions and in averting some mistakes in judgment.

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[19] Elizabeth Marting, The Marketing Job (American Management Association, 1961), p. 114.

[20] *Ibid*., p. 150.

[21] *Ibid*.

## Employer's Opinion of His Ability to Forecast

In view of most employers' hesitation about making occupational projections, learned in the early stages of the survey, a question was included in the structured interviews[22] to further determine the degree of confidence of the employer in his projections. Employers were simply asked to comment on their confidence as to the accuracy of the occupational projections provided. Admittedly, this procedure constituted an opinion survey which would be colored by whether the employer admitted errors or bragged about success. In actuality, a majority of the employers were quite candid in their answers.

Responses to this question revealed that employers experiencing stable employment during the recent past were quite confident of their ability to project. Frequently in interviews employers prefaced their confidence statements with remarks about the "small changes" occurring in their work forces. Progressive, fast-changing firms doubted their accuracy because of the many changes in technology, sales, etc., taking place in the company. Table 10 (p. 85) indicates the employers' opinions categorized according to no projections, guess, little confidence, and confidence.

Only 60 out of the 127 respondents were found to have confidence in their projections. Others either did not provide data or were less than confident. Interpreting this data is difficult, since employers were expressing opinions. In some cases the confident employers seemed less than knowledgeable, and in other cases the doubters appeared to have done an excellent job although unwilling to brag about it. At least two firms regularly making long-range manpower plans had achieved little accuracy.

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[22] See Appendix C, p. C4.

TABLE 10.--Confidence in Occupational Projections of Interviewed Respondents by Major SIC Industry Group and Degree of Confidence

| Major SIC Industry Group | SIC Code | Number Inter-Viewed | No Projec-tions | Guess | Little Confidence | Confidence |
|---|---|---|---|---|---|---|
| Construction | 15-17 | 7 | 0 | 4 | 0 | 3 |
| Manufacturing | 19-39 | 71 | 12 | 8 | 22 | 29 |
| Utilities | 40-49 | 9 | 2 | 1 | 3 | 3 |
| Wholesale and retail trade | 50-59 | 17 | 1 | 2 | 2 | 12 |
| Finance | 60-67 | 13 | 1 | 0 | 3 | 9 |
| Service | 70-89 | 8 | 1 | 0 | 3 | 4 |
| Government | 91-93 | 2 | 1 | 0 | 1 | 0 |
| TOTAL | | 127 | 18 | 15 | 34 | 60 |

Employers particularly directed their remarks toward the survey request for 3- and 5-year projections for individual occupations. Frequent comments were made that projections for one or two years could have been provided. The length of the projection period, then, was the major issue in the reluctance to provide data. Apparently, the two projection periods of three and five years are beyond the ability of the average employer unless the purpose of the survey is simply to collect guesses of persons in industry. PROJECT VISION's staff questions the necessity for two projection periods, believing that the longer period just complicates the issue without compensatory results.

### Projections as Reasons for Not Responding

The most difficult and perplexing problem facing an employer who receives a Skill Survey questionnaire is the task of making occupational projections. Current employment figures can be collected by his secretary and replacement needs estimated on one year's experience, but projections for a variety of specific occupations require a judgment on many determinants: technology, manufacturing process, sales forecast, and general economic conditions in the future and their effect on each occupation.

Studies of individual occupations by experts have often resulted in projections which proved to be quite inaccurate. For example, the automation scare of the early sixties caused predictions of occupational changes that were never validated. Because of these difficulties and the personnel man's lack of training and expertise in forecasting manpower needs, it came as no surprise that employers were quite hesitant to sign their names to a document projecting future (in five years) occupational needs for their firms. Too many things could develop that would affect their projections. For these reasons, a number of employers telephoned to say they would respond only if they could skip the questions on occupational projections. Table 11 (p. 87) shows the number of employers from whom such calls were received.

One hundred and thirty-eight employers, 60 of whom had more than 100 employees, preferred not to make any occupational projections. Of those providing projection data, 22 made projections for 1970 alone, and four did not provide data for 1970 but did make projections for 1972. Taken altogether, even those responding were reluctant to return the information for which the skill survey was principally undertaken.

Reasons for not providing occupational projections varied, but in general they involved the following: (a) The projection period was too long -- one year or two years was felt to be realistic; (b) the number of occupations for which information was requested was too extensive; (c) to do an adequate job, too much time and manpower would be required; (d) a number of employers saw little action resulting from the survey and so made little effort to properly complete it; and (e) many expressed the opinion that it was an "impossible" task.

TABLE 11.-- Proportion of Respondents in Employer Needs Survey Who Did Not Provide Occupational Projections By Major SIC Industry Group and Size of Establishment

| Major SIC Industry Group | SIC Code | All Responding Establishments | | | Size of Establishment | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 4-49 Employees | | | 50-99 Employees | | | 100 or more Employees | | |
| | | Total number | Projections not provided | | Total number | Projections not provided | | Total number | Projections not provided | | Total number | Projections not provided | |
| | | | No. | Percent | | No. | Percent | | No. | Percent | | No. | Percent |
| Construction | 15-17 | 16 | 4 | 25 | 5 | 2 | 40 | 2 | 2 | 100 | 9 | 0 | 0 |
| Manufacturing | 19-39 | 171 | 38 | 22 | 13 | 3 | 23 | 14 | 6 | 43 | 144 | 29 | 20 |
| Utilities | 40-49 | 25 | 2 | 4 | 8 | 1 | 13 | 4 | 0 | 0 | 13 | 1 | 8 |
| Wholesale and retail trade | 50-59 | 182 | 42 | 23 | 87 | 34 | 39 | 58 | 3 | 5 | 37 | 5 | 13 |
| Finance | 60-67 | 38 | 4 | 10 | 18 | 3 | 17 | 1 | 0 | 0 | 19 | 1 | 5 |
| Service | 70-89 | 102 | 38 | 38 | 48 | 15 | 31 | 14 | 5 | 36 | 40 | 18 | 45 |
| Government | 91-93 | 57 | 10 | 18 | 6 | 3 | 50 | 7 | 1 | 14 | 44 | 6 | 14 |
| Total | | 591 | 138 | 23 | 185 | 61 | 33 | 100 | 17 | 17 | 306 | 60 | 20 |

### Special Industry Difficulties as Reasons for Inability to Make Occupational Projections

Some industries have more indeterminable factors to consider than others, yet employers in every industry interviewed presented conflicting opinions as to accuracy of their projections and numbers of independent variables. For example, employers in the construction industry must make assumptions about future, beyond one year, determinants such as Federal fiscal and monetary policies affecting interest rates, consumer tastes in buildings, new technology, local industry building loans, and their firms' success in winning bids for construction. The thought given to each assumption is crucial in developing accurate occupational projections. For this reason employers in the construction industry have little confidence in projecting future skill needs.

Another example of industry difficulties is the SIC 90 group -- Local, State, and Federal government -- where many uncertainties exist beyond the 1-year budget plan. Indeterminate variables are: Federal spending levels, new legislation resulting in new programs, and new civil service policies. All this is dependent on the make-up of Congress and, often, on the mood of the country. The result is that government agencies must contend with many uncertainties in the future beyond the 1-year period.

The problem then is not whether employers are able to make projections, but their willingness to do so and the degree of error that might result. Projections are all based on assumptions. If assumptions fail to hold true, it is not the fault of the projector. Employers in every industry must contend with uncertainties, some having greater effect on occupational employment than others. It is one thing to project overall employment for a firm or agency; it is another thing to break that figure out by occupations. The degree of precision required makes the difference.

## 4. Conclusions and Recommendations

The average employer interviewed during the survey follow-up exhibited little confidence in his ability to make detailed occupational projections. This was the result of lack of training or experience in this task, in addition to misunderstanding the nature of projections versus forecasts. Other contributing factors relating to this problem were the number and importance of indeterminant variables to be considered and how the projectors treat such variables. Since the precision required in making occupational projections varies greatly, and the degree of error can rarely be measured, it is difficult to make judgments concerning the accuracy of the results.

The following statement indicates the dimension of the problem.

> In a changing world, validation of projection is rarely possible. In the case of projections made for policy purposes, it may not be appropriate, since a projection may be successful only to the extent that it is proven false. If its purpose was to warn of impending problems, the warning may permit avoidance of the crisis and invalidate the projections.[23]

Many employers refuse to make projections because of lack of confidence in handling the uncertainties of the future or lack of confidence in the stability of assumptions. Yet, the employer cannot be expected to use a crystal ball; an estimate in terms of what is known today can only be expected. This is the nature of projections.

The concept of projections versus forecasts is also present. The same authors tell the reader that

> the projector, after examining past trends and current developments, develops implicitly or explicitly, a working model of the system. He sets forth a series of assumptions about how the important variables are likely to behave in the future, and then uses these assumptions to modify extensions of the past performance of the variables. . . . The forecaster is a projector who has the confidence and the institutional freedom to state his conclusions unconditionally and to stake his reputation on them.[24]

Unfortunately, both employer and educator see data generated from the Area Skill Survey technique in terms of forecasts rather than projections. The result is that the employer lacks confidence and is often hesitant to provide data. The risk is compounded later on because the educator, unaware of the limitations in the survey results, views them with undue confidence. The survey report can thus imply a spurious accuracy. However, a carefully considered presentation of the results acquaints the reader with limits of the methodology, thus reassuring the employer and warning the educator.

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[23] Garth L. Mangum and Arnold L. Nemore, "The Nature and Function of Manpower Projections," Industrial Relations, 2, No. 3 (May 1966), p. 2.

[24] Ibid.

In order to do a creditable job of conducting an Employer Needs Survey, the following recommendations should be considered:

1. The survey technique should be used frequently (every one or two years) so that Employment Service staff, employers, and educators can become familiar with the technique. Second, and more important, frequent use of the technique will allow the Employment Service staff to learn to adjust projections on the basis of experience with various kinds of industries during different economic conditions. It is hoped that through the frequent use of the survey technique a valuable learning process will result.
2. The occupational projection period should not be over two years. No matter how desirable it might be to know about occupational requirements five or ten years hence, it is just not practical nor feasible to obtain such information from employers by means of a mail questionnaire.
3. To elicit an adequate response rate, the questionnaire must be simplified by limiting the number of occupations surveyed. Also, since to ask about training as far in the future as three and five years is unrealistic and serves only to discourage response, the projection period for this should also be reduced in length.

## AREA EMPLOYMENT BENCHMARK SURVEY: A NEW APPROACH

Going beyond a modification of the standard Area Skill Survey, PROJECT VISION recommends a radical change in the questionnaire design as described in the BES Handbook. If one of the major objectives of an overall information model is to provide data on vocational training needs on a local labor market area basis, the questionnaire sent to employers should emphasize that objective. Among other things, it should:

> Obtain current employment data by occupation either yearly or every two years.
>
> Ascertain the extent to which occupations are able to be directly entered by a vocational school graduate.
>
> Obtain an approximation of the turnover rate, replacement needs, and extent of promotion-from-within policy of employers by occupation.
>
> Obtain an approximation of employers' "favored" sources of training by occupation.

In other words, the data outlined above are really employment benchmark data, similar to economic benchmark data, made relevant to the vocational educator. Therefore, for this purpose, as the following paragraphs indicate, certain parts of the standard Area Skill Survey questionnaire could be eliminated.

a. Requests for data on replacement needs are of dubious value. The objective is to determine the extent of job opportunities in occupations with considerable employment but low expansion possibilities. Asking the employer to estimate next year's deaths and disabilities is unrealistic. Even estimates on entrance to the Armed Forces are difficult enough to obtain in a large plant. Retirement estimates, though, seem a realistic enough question and probably should be requested since they can flag an aging work force by occupation. In addition, improvement currently under way in the working life tables by BLS may result in accurate enough approximations by occupation to foresee and thus prevent some unanticipated disaster caused by sudden retirements of large numbers of workers in an occupation, however unlikely this event might be.

b. Employers at this time in history seem unable to do a credible job of making 3- or 5-year occupational projections for the occupations in their establishments. PROJECT VISION found that they either guessed or failed to respond to this phase of the questionnaire. Therefore, in light of the experience of many labor market analysts working at the operating level, this idealistic but impractical part of Area Skill Surveys could be eliminated.

c. The BES Handbook asks employers to "enter . . . the number of workers expected to complete plant training programs . . . for each occupation in the next 2 and 5 years." The question was answered by only a few employers. It only complicated the questionnaire. Elimination of this question is strongly recommended, although the information requested would certainly be "nice to have."

## The New Design

Taking the preceding remarks into consideration, the preliminary design of a new type of Area Skill Survey could be conceived along the following lines.

Employer survey programs would be planned on a regular, continuing basis. Budgeting and funding should be provided for to cover the cost of regular surveys on either a 1- or 2-year basis as experience dictates. A survey cycle should be coordinated at area, State and regional levels allowing educators and economists to consider problems of the different size labor market areas.

It is known that some of the employers included in the Experimental Employer Needs Survey were surveyed as many as five times in the year preceding the Experimental Employer Needs Survey by various research units associated with the WSES. Yet, data received are not collected at any one point by company and in most cases are not retrievable by hand. Moreover, local administrators and employer relations representatives have no access to this information. In other words, a vast amount of data is lost each year, resulting in repetitious surveys and inadequate dissemination of data to local manpower officials.

Since labor market research today lacks coordination and a systematic approach, resulting in information gaps and slow dissemination of much needed information to students, counselors, educators and poverty program directors, only an organized, systematic approach, including use of computers, can bring order out of the present chaos. Every effort should be made to systematize and expedite future surveys in order to make the results of more immediate value.

## Methodology

Before the survey is actually begun, a semipermanent committee (possibly a subcommittee of CAMPS)[25] should be formed, representing a variety of training agencies in the community -- industry training directors, apprenticeship training agencies, schools, labor unions and chambers of commerce.

It would be especially helpful to prepare suggestions on occupations to be surveyed. As suggested by PROJECT VISION, occupations of an interindustry nature (not limited to one 4-digit industry) should be selected with attention given to suspected surplus and shortage occupations, significant occupations (by size), expanding occupations and, in the lower skill levels, a grouping or cluster of occupations. The questionnaire sent to small employers should have an open-end occupational list since such firms have few occupations to consider. Before using any questionnaire form, a pretest in each major industry should be made to avoid obvious mistakes.

If the survey were taken regularly, publicity would not need to be extensive, especially if the employer could see the relevance of the survey and the results in terms of changes in vocational courses. The questionnaire should be accompanied by a letter indicating the purpose of the survey, information needed, and importance of the data in providing skilled workers to employers. The letter should include a statement on confidentiality, a submittal date, and the name and phone number of the appropriate person to contact if the employer has any questions. All establishments not responding by a certain date should be reminded by mail. Large establishments might be reached by phone.

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[25] Cooperative Area Manpower Planning System.

## A PROPOSED QUESTIONNAIRE

The form of the questionnaire might be arranged as follows:

### FORMAT OF PROPOSED QUESTIONNAIRE

| | |
|---|---|
| AREA EMPLOYMENT BENCHMARK SURVEY | FORM A: Technicians |
| Firm Name<br>Address<br>SIC<br>Personnel Dept.Rep.<br>(for person completing form) | Number of employees on all payrolls as of____________<br>Number of employees you expect to have in one year__________ |

PLEASE FURNISH BELOW THE DATA REQUESTED FOR EACH OCCUPATION:

| DOT Code | Occupation | Current Employment | Retirements the past year | No. in Col.C hired in the past year | Source of training of those in Col.E if trained in past two years* | | | |
|---|---|---|---|---|---|---|---|---|
| (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) |

*On Form A, these columns would contain educational and training facilities appropriate to Technicians; e.g., high school, public vocational school, private training institutes, military training course.

No attempt was made in this preliminary design for the Benchmark Survey questionnaire to spell out detailed instructions for its use. However, PROJECT VISION is suggesting ways in which the detailed instructions might be developed and the resulting data interpreted. These are meant to be idea-provoking and do not by any means exhaust the possibilities.

(A) and (B). Use DOT codes and titles if pretest shows that employers recognize the titles. A trained occupational analyst should determine if other titles are more appropriate so that local industry terminology will be understood by both employer and those who must analyze the data later.

(C). Current employment by occupation at a point in time can be used to establish a time series in the following manner:

Illustration

| Current Employment | 1966 | 1967 | 1968 |
|---|---|---|---|
| X Occupation | 100 | 200 | 300 |
| Y Occupation | 100 | 100 | 100 |

Conclusion: Employment in Occupation X is expanding rapidly. Employment in Occupation Y is not expanding, but may be subject to turnover or retirements or be a source of promotion for Occupation X.

(D). Retirements for a number of expanding occupations will be nil, but data collected over a few years should indicate occupations with an aging work force which may require special research leading to training or retraining programs.

(E). Number of persons hired in the past year who are still at present employed will indicate the extent of lateral and vertical transfers by occupation from outside the company being surveyed.

Illustration

| Current Employment | No. of (C) hired in past year | Training | | | |
|---|---|---|---|---|---|
| (C) | (E) | (F) | (G) | (H) | (I) |
| 100 | 50 | 10 | 5 | 5 | -- |

Conclusion: While it is difficult to determine accurately the total accessions and quits, it is possible to clock the number of employees new to a company at a point in time. As a result, it is seen in the above illustration that 50 people were hired from outside the company in the past year, and the number (20) that came from the sources identified in Cols. F, G, H, and I. It may also be seen that the remainder came from other industries, in or out of the area, by lateral or vertical transfer, which, in turn, might indicate the extent of job bidding and related price increase.

Illustration

| Occupation X | 1966 | 1967 | 1968 |
|---|---|---|---|
| Current Employment (Col.C) | 100 | 120 | 130 |
| Number hired last year of current employ.(Col.E) | 2 | 3 | 3 |

Conclusion: Employment expanded in three years by 30 workers, but only 8 workers were hired from outside the company, leading to the belief that promotion from within is the company policy (for Occupation X).

(F), (G), (H), (I). Since each type of occupation has a different variety of training sources, this part of the questionnaire would be customized for (1) Technical Occupations, (2) Data Processing Occupations, (3) Skilled Machine Shop Occupations, etc. This part of the questionnaire would be determined following consultation with teachers, vocational education advisory committees, and other educators and training advisors so that it would be relevant to the occupational (and geographic) area covered.

Application of Data

If this system were adopted and maintained, a number of uses could be made of the data generated. By use of computer, employers who promote from within could be identified and approached by phone or mail to learn of the occupational progressions used. This information would be of special value to counselors. Coded returns could be sorted to reveal:

1. Those promoting from within, by certain occupations.
2. Those expanding employment, by certain occupations.
3. Those employing a significant number of workers in a certain occupation.
4. Employment by occupation by geographic area (Zip Code).
5. Employers shunning recent vocational school graduates, preferring job shifts or transfers by occupation.
6. Training preferences by employer by size, SIC, and location.
7. Those employers indicating increased employment not evidenced by occupations surveyed, pointing up an expanding area not sufficiently identified on the questionnaire.

Equipment Needed

In this age of increased manipulation of data, a computer is required to make this system work. In addition, a microfilm system is required to retrieve data by company so that researchers do not start from scratch each time they begin a survey. With a microfilm system, a company's survey responses could be viewed in one place, even on receiving apparatus in an urban Employment Service office, allowing local administrators and educators access to valuable information.

## Confidentiality

It might be feared that questionnaires not destroyed would compromise the individual employer. However, safeguards can be taken that would lessen any apprehension on this matter.

## Conclusions

An Area Employment Benchmark Survey, developed according to the suggested design, could fill a serious gap in the process of acquiring accurate information about the current labor market. If this type of survey were taken regularly, a number of trends could be identified that might then be researched by other methods. Most importantly, it would provide local data that could be used in comparing trends throughout the country. For example, it would be of value in making adjustments for application of the BLS Occupation-by-Industry Matrix technique used in obtaining long-range occupational needs projections.

In final analysis, it is believed that a survey of this nature could be an integral part of a labor market information system useful to anyone interested in improving the relevance of vocational education in the United States.

# CHAPTER V

# OTHER EMPLOYER-BASED APPROACHES

## SUMMARY

PROJECT VISION was a research project of many parts. Making use of some of the findings of the August 1967 Milwaukee Standard Metropolitan Statistical Area Experimental Employer Needs Survey, three of its efforts were based principally on interviews with experts in selected industries or firms. The techniques were designed to furnish data from which demand projections for workers could be prepared which would be substantive enough and reliable enough to provide occupational direction for local area vocational programs. Criteria used in judging the effectiveness of the results were the same as for all techniques tried and tested by PROJECT VISION. These included ease of data collection; adequacy and validity of the information obtained; length of time involved in collecting, analyzing, and transmitting the results to vocational education administrators; and the costs involved. This chapter is concerned with all phases of the Leading Indicator approach and the Industry Expert approach. In terms of the results desired, the Industry Expert approach proved to be the more rewarding. A pragmatic evaluation of these first attempts in breaking new ground in the Milwaukee SMSA is the subject of this summary.

The Leading Indicators experimental approach relied in the first instance on the area Employer Needs Survey for its choice of establishments to be studied. In contrast to this, the Industry Expert approach for the Printing and Publishing industry based the selection of its sample on data already available from the daily operations of the Employment Service at both the State and local levels. The Industry Expert approach for the Metal Casting industry made use of both Bureau of Employment Security data and information from the area Employer Needs Survey in the determination of the sample used.

Because of its fundamental dependence on the information resulting from an Area Skill Survey for its sample, the Leading Indicator approach is not a practical simple technique for determining occupational trends in a labor market area. It can best be used to provide supplementary information. In contrast, the sampling method of the Industry Expert approach has a much broader base and is more economical in terms of time involved and use of personnel. Using as it does both State and local Employment Service data already on hand, it can be undertaken with relatively little advance preparation once the sampling method has passed the experimental stage. It also has the advantage of easy establishment of the size and composition of the sample, thereby allowing for variation from time to time and place to place, and it can be tailored to a current situation in terms of an industry's staffing needs and available funding.

From the point of view of adequacy and validity of data obtained, the Leading Indicator experiment approach was found to be wanting, primarily in terms of the thinness of the sample obtained from the Experimental Employer Needs Survey. It is entirely possible that some other method could be devised for determining across-the-board "leading firms" in a given labor market area. If this can be achieved and the questionnaire improved, it is quite possible that useful results could be obtained. The follow-up interviews in this trial study elicited enough worthwhile data on the general direction of occupational changes in large firms to warrant giving this method further study. The chief drawbacks were in terms of the costly sampling base and lack of precision in the terminology used.

The study of the Printing and Publishing industry was in effect a trial study for the Industry Expert approach, while the Metal Casting study was an improved and more productive version of this approach. Difficulty in the use of SIC groups for sample determination was evident almost from the beginning in the Printing and Publishing study. Occupational homogeneity was not found in the SIC categories because in this major group classification industrial establishments are grouped by product rather than by occupational methods. In planning the Metal Casting industry study, the SIC groups involved were modified to yield groups of establishments with similar occupational patterns.

Two other methods of studying occupational trends for the Printing and Publishing industry likewise were not fundamentally productive. Meager industry representation precluded the usefulness of Occupational Analysis Field Center schedules.[1] The Unfilled Openings-Occupational Outlook Handbook Method[2] of projecting specific occupational needs for the industry was of scant value because the public Employment Service offices in the Milwaukee area place few workers in the printing and publishing firms.

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[1] Schedules are prepared on USES Form 546 Exp.

[2] See PROJECT VISION's test of the method presented in Chapter VII.

By far the most elaborate of the three employer-based studies was that of the Metal Casting industry. From the beginning this study used a modified SIC classification for the industry, and thus offered homogeneous occupational patterns that lent themselves to analysis in several directions. An occupational matrix for production employees was obtained; turnover rates were calculated. Also, a comparison was made for two occupations with the Unfilled Openings-Occupational Outlook Handbook data. This comparison indicated that in general the methods yield comparable results, and in addition offered the possibility that if the methods used a more refined occupational classification, results more pertinent to vocational education planning could be obtained. In comparing the results of the Metal Casting industry study with data from the area Employer Needs Survey for similar types of firms, the whole problem of basing occupational projection data on unmodified SIC classifications became apparent again.

Employer interviews were a major part of the Metal Casting industry study. They were most successful because of the enthusiastic reception that firm representatives gave to the purpose of the study and the cordial relations that the study staff established with the industry representatives. Admittedly overly elaborate in some aspects in order to test the technique to the fullest, the Metal Casting industry study concludes that the overall method is a viable one for yielding occupational projection data for a single industry within reasonable cost limitations, with the reservation that the results of this technique would always be more qualitative than quantitative in nature.

Detailed reports of these approaches follow.

## LEADING INDICATORS EXPERIMENT APPROACH

The Leading Indicators approach was one of several experimental efforts undertaken by PROJECT VISION to develop methods for supplementing findings of an Area Skill Survey. Under certain circumstances it might be an alternative simplified technique. This technique was based on the assumption that "leading firms" in various industries were progressive in nature and probably would possess the latest machinery and methods of production which could foreshadow major occupational changes in the community. Once identified, these companies could be expected to supply labor market analysts with information on new trends in given industries, changes in occupational mix, and emerging occupations.

The Employer Needs Survey questionnaire was the vehicle used for the selection of the leading firms to be studied. The effort to determine industry leadership, trends in product lines, and the introduction of advanced techniques was based on data assembled for two contiguous 5-year periods -- the one immediately before the Milwaukee area survey and the 5-year projection period on which the survey was based. The questionnaire included the following inquiries:

In the last five years has your Milwaukee Area Plant(s)
  increased capacity 25% or more[3] yes no
  changed product lines yes no
  relocated yes no

Within the next five years is your local firm planning to
  increase capacity by 25% or more yes no
  add a new product line yes no
  relocate yes no

Subsequent to the assembly of the questionnaire data, 115 survey respondents were selected for interviews concerning one or more of the leading indicators.[4] One of the principal purposes of this follow-up study was to determine whether the Leading Indicator questions did in fact identify leading companies in an industry.

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[3] As used in the Milwaukee Area Employer Needs Survey, this question was meant to refer to capital outlay in order to increase production and sales through expansion or through renovation and modernization of present facilities; for example, net worth of Company A was 25 percent greater in 1967 than it was in 1962.

[4] This follow-up study was conducted between November 1967 and February 1968. The companies to be interviewed were selected from the 575 respondents to the Milwaukee area survey primarily on the basis of their having answered at least two of the Leading Indicator questions affirmatively and having an employment of 100 or more. Whenever an industry was not represented, the above qualifications were lowered by including employers having fewer than 100 employees or employers who answered one Leading Indicator question affirmatively (see App. C, pp. C7-C13).

The following three sections present the findings and conclusions relating to each of the three Leading Indicator questions.

## 1. Increased Plant Capacity as a Leading Indicator

Company leadership in an industry is the result of many interlocking components. These would need to be assessed before any final determination that a firm is indeed a "leading" firm. Since such an elaborate analysis of the firms included in the Milwaukee Employer Needs Survey was beyond the scope of this study, it was decided to test the potential usefulness of a simplified indicator, namely, a minimum past or anticipated growth in capacity of 25 percent in large firms over a 5-year period. The 5-year projection period was chosen to coincide with the 5-year projection period of the Employer Needs Survey. The 115 large firms for which follow-up interviews were carried out were the subject of the test and the findings are herewith described.

Table 12 shows the distribution of the 115 firms by SIC groups and indicates whether these firms had experienced or expected to experience an expansion of at least 25 percent in a 5-year period.

TABLE 12.--SIC Industry Group of 115 Large Firms Interviewed by Past and Anticipated Expansion Experience

| Major SIC Industry Groups | Total Firms Interviewed | Firms Expanded 25 Percent or More | | | |
|---|---|---|---|---|---|
| | | Total | Last 5 Years | Next 5 Years | Both |
| Construction | 6 | 6 | 3 | 5 | 2 |
| Manufacturing | 59 | 56 | 48 | 45 | 37 |
| T.C.U.* | 9 | 6 | 6 | 4 | 4 |
| Trade | 18 | 12 | 11 | 10 | 9 |
| F.I.R.E.** | 13 | 7 | 6 | 7 | 6 |
| Service | 8 | 6 | 5 | 4 | 3 |
| Government | 2 | - | - | - | - |
| Total | 115 | 93 | 79 | 75 | 61 |

*Transportation, Communication, and Utilities

**Finance, Insurance, and Real Estate

Of the total number of large firms interviewed (115), 93, or 81 percent, indicated either past or future expansion of at least 25 percent in the selected 5-year periods. Sixty-one firms, or more than half (53 percent), said that expansion in their firms not only occurred in the recent past but was expected to continue during the upcoming 5-year period. Were the characteristics of the expansion experience in these firms such as to demonstrate the usefulness of this method of selecting firms for the Leading Indicator Experiment approach?

Although it was intended that the questionnaire inquiry on "increased capacity" refer to "increased capital outlay" (see Footnote 3, p. 102), the interviews held subsequently with representatives of the 115 large firms elicited the information that the answers in many cases were based on dollar increases resulting in part from increased production, in part from plant acquisitions, and in part from cost figures which reflected the prevailing nation-wide inflationary situation. Of the 93 companies interviewed, 22 firms, or nearly 25 percent, acknowledged that the increases in "production" which they had indicated on the questionnaire were due primarily to inflation and increased sales, and had in actuality very little to do with capital investment.

In the economic climate of the 1960's, the choice of "25 percent increase in capacity" as an indicator of a unique pattern of growth turned out to be an inadequate measure of company expansion without qualifying information. The interviews indicated the difficulties which arise when manufacturing terms such as "capacity" and "production" are introduced on a mail questionnaire without being strictly defined for the purpose of the study. In conclusion, it might be said that while this particular "leading indicator" in this particular study did not produce adequate results, it is an approach that should not be immediately discarded, because it might prove valuable with refinements in some future study.

## 2. New or Changed Product Lines as a Leading Indicator

The inquiry regarding changed or new product lines on the mail questionnaire was made for the purpose of discovering whether there were in the Milwaukee area, at the time of the Employer Needs Survey, new industrial and occupational trends of sufficient significance to serve as a base for recommending changes in the direction of local vocational education programs and recruiting programs of employers and employment agencies. Although the data collected could be judged minimal, the very absence of major evidence of new or changed product lines has valuable connotations. Planners may be well advised to place their major emphasis for the next five years on the industrial and occupational mix as found at the time of the survey. A brief summary of the information obtained through follow-up interviews with 37 firms follows.

The follow-up interviews with the 115 large firms included in the development of the Leading Indicator experiment approach revealed only four firms that could be said to actually have new products, that is, new to their company. Some 33 other firms had reported that they had produced a new product or would produce a new product, but the refinement of the original responses resulting from interviews indicated that plant personnel responsible for filling out the questionnaire associated "new products" with new services, new applications for existing products, new models of existing products, and other internal modifications short of the actual introduction of a new product. Consideration should therefore be given to including on future questionnaires a definition of "new product" designed to bring responses more nearly in line with the purpose of the question.

Although only four companies actually had new products, all 37 companies indicating on the questionnaire that they had "new products" were asked in the follow-up interviews to indicate the effect, if any, these product changes would have on employment. The questions and employer responses were as follows:

1. How will this (new product) affect employment?
   Increase 25 Same 4 Unsure 8

2. Will old employees be retrained?
   Yes 11 No 16 Unsure 10

3. Is this change in products a new industry trend?
   Yes 12 No 13 Unsure 12

4. Will this change (in products) affect other industries?
   Yes 4 No 25 Unsure 8

5. Will other product lines go out of existence?

   In your company? Yes 0 No 27 Unsure 10
   In your industry? Yes 1 No 25 Unsure 11

A number of important findings emerged from these questions and answers that deserve consideration. Of the 37 employers interviewed, 25 of them anticipated increased employment levels. Of equal importance for planning purposes was the evidence that employers are turning toward sophisticated machines which a machinist will have to set up but which a semiskilled operator can run. Overall, the response showed no need for significant retraining but rather some on-the-job training. Moreover, in some instances only a few hours would be required to familiarize current operators with the new machinery. Another substantive finding was that while employers did not acknowledge truly new trends in their industry, they were vitally aware of constant changes in products and machinery and were forced to take eventual obsolescence into account. However, they thought that the rate of obsolescence of currently available products and models was such that it would require a period longer than the 5-year projection period of the study to complete.

### 3. Plant Relocation as a Leading Indicator

Approximately 15 percent of the total number of respondents in the Milwaukee Employer Needs Survey (575) had either moved in the 5-year period prior to the survey or planned to move in the succeeding five years. Of these 88 firms, more had moved (57) than planned to move (37). A few (6) had moved in the past and planned to move again. Fifteen of these 88 firms were interviewed in the follow-up study of large firms. Their responses to the key sections concerned with management decisions on the interview questionnaire are presented in the following table.

TABLE 13.--Fifteen Employer Responses to Relocation Interview Questionnaire

| Management Decisions | Yes | No | Unsure |
|---|---|---|---|
| 1. Modernization of equipment | 5 | 8 | 2 |
| 2. New computer or another one added | 5 | 6 | 4 |
| 3. Switch to numerical control machines | 0 | 12 | 3 |
| 4. Change in employee skill level | 1 | 12 | 2 |
| 5. Are changes in employee skill level related to a change in employment? | 0 | 10 | 5 |
| 6. Was new machinery installed to |  |  |  |
| a. cut labor costs | 0 | 5 | 10 |
| b. increase production | 3 | 2 | 10 |

It was apparent from the information obtained in the interviews that the larger firms were regularly purchasing newer equipment in order to improve operations and keep up with competition. It was also apparent that when a company moved to a new location because it needed to expand (a large majority of the interviewed companies moved for this reason), it modernized the machinery and equipment which it would have modernized eventually anyway. The machinery purchased was generally more refined than the existing equipment, but, important to the findings of this study, there was evidence that the skill level of operators and set-up personnel did not change, or changed very little. The only substantial change in personnel was the addition of data-processing personnel when a computer was installed.

### 4. Findings

It is emphasized again that the Leading Indicator experiment approach in the experimental form used by PROJECT VISION was not definitive in its results. No one of the techniques produced results precise enough to indicate the direction of major occupational changes in the labor market area. Limitations were found in the design of each method, some of which could be overcome in the planning stages. The major difficulty, and one which probably cannot be overcome as long as the techniques are based on the standard Area Skill Survey technique, is the thinness of the sample of large employers for individual industries. There would always be a tendency for the skill survey to provide, among its respondents, only a few firms which would meet the criteria for inclusion.

## INDUSTRY EXPERT APPROACH

In addition to the Leading Indicators experiment approach described in the first half of this chapter, a second type of industry approach was tried for the purpose of developing occupational projections. This innovative technique, termed the Industry Expert approach, was applied to two well-defined, activity-oriented industries, both of major importance in the Milwaukee SMSA. The Printing and Publishing industry was selected because the growth and development of several components of the printing industry have led to Milwaukee's becoming one of the Nation's leading graphic arts centers; the other industry, Metal Casting, was chosen because it is one of Milwaukee's important basic industries[5] and because by its nature it is easily identifiable.

The Industry Expert approach sought to test the feasibility of obtaining current and projected occupational information on an industry-by-industry basis, in contrast to the Area Skill Survey technique of studying an entire metropolitan complex at one time. An evaluation, the methodology, and the findings of this experimental approach, together with recommendations, are presented first for the Printing and Publishing industry and then for the Metal Casting industry.

## Printing and Publishing Industry

### Evaluation

The value of the Industry Expert approach as undertaken by PROJECT VISION for the Printing and Publishing industry was twofold. While the source material yielded more quantitative trend data for the industry as a whole than for specific occupations, it was established that the Industry Expert approach nevertheless shows considerable promise as an approach to the study of occupational trends and projections. Moreover, the undertaking was particularly useful in revealing areas for improving the technique; in providing the experience on which to develop more pertinent occupational trend data; and in concluding that this method probably is one which, even with refinements and amplified data, does not lend itself well to quantitative projections, but rather to general occupational trends based in some measure on the judgment of industry experts. The degree to which this method as applied to the Printing and Publishing industry would be useful for vocational education planning was not established.

### Scope and Methodology

Three basic assumptions underlay the planning of the Industry

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[5] At the time of this special study (early 1968), total employment in the 89 firms engaged in metal casting activities, including captive operations, comprised 2.5 percent of an estimated total employment of 588,500 in the 4-county Milwaukee SMSA.

Expert approach, namely

> that no important changes in the current national economic situation, such as a general war or wide-spread depression, would occur during the five years following the study which would cause past trends to be altered;
>
> that SIC codes contain groups of establishments which are homogeneous from the standpoint of occupational structure, and that staffing schedules of large firms and small firms can be projected to reflect employment patterns for each SIC 4-digit division; and
>
> that persons knowledgeable in the industry can assess past trends and provide information as to whether they will continue into the future.

The study covered the Printing, Publishing and Allied Industries in the Milwaukee SMSA as defined for Major Group 27 of the SIC.[6] A wide variety of sources was used to obtain as much relevant information as possible on the industry as a whole and on occupational trend data in particular. The basic data were derived from U.S. Department of Labor, Printing Industry (BLS Bulletin No. 1549, May 1967); Occupational Outlook Handbook, Printing Industry; and

Unemployment Compensation Employment Data, 1957-1966
Unfilled Openings--OOH Study Data compiled by PROJECT VISION
Staffing Schedules, Wisconsin Occupational Analysis Field Center, 1962 and 1967
Interviews with experts in the Graphic Arts Association, at the Milwaukee Journal, and with several representative employers

There follows, for each of the sources of information, a brief summary of the steps involved and of some of the problems encounter- in relating the data to the overall objective of designing a model system for projecting occupational trends in selected industries.

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[6] The short title "Printing and Publishing" will be used throughout the report.

### 1. Unemployment Compensation Employment Data, 1957-1966

a. Steps taken to acquire information.--Unemployment Compensation Department reports of employment by SIC codes were used to plot employment from 1957 through 1966 for each 4-digit SIC group within the industry; then

(1) Employment within each group was divided between large establishments (100 or more employees) and small establishments (under 100 employees);

(2) Average employment per establishment was calculated for both large and small establishments for each 4-digit SIC group; and finally

(3) Trend lines were established for total employment, number of firms, and average employment per firm of both large and small firms for each SIC group.

A summary of the total average annual employment for each of the 4-digit groups in selected years, together with the net change from 1961-1966, is presented in Table 14 (p. 111).

b. Problems encountered.--This phase of the study developed some quite well-defined employment trend information for principal segments of Major Group 27, but its usefulness in this study was limited because the SIC categories classify establishments by product rather than by method of printing. As a result, when staffing schedules were analyzed by industry group, the expected homogeneity of occupational distribution within such groups usually did not exist. Evidence of the problem is given in the following samples:

(1) SIC 2751 (Commercial Printing other than Lithographic) combined silk screen occupations with gravure and rotogravure processes.

(2) Such codes as 2721 (Periodicals) and 2731 (Book Publishing) combine publishing and printing. However, some establishments published only and had no print shops; other publishers also did their own printing. A few also contracted for outside printing. In each case, the occupational distribution differed.

TABLE 14.--Printing and Publishing Employment 1961-1966 Milwaukee SMSA

| SIC Industry Groups | Number of Employees | | | | Net Change 1961-1966 |
|---|---|---|---|---|---|
| | 1961 | 1962 | 1965 | 1966 | |
| Newspapers | 3,361 | 3,583 | 3,694 | 3,762 | +401 |
| Periodicals | 415 | 420 | 449 | 457 | +42 |
| Books, printing | 629 | 549 | 517 | 564 | -65 |
| Misc. publishing | 103 | 94 | 85 | 40 | -63 |
| Commercial printing (except lithographic) | 2,695 | 2,762 | 2,135 | 1,935 | -760 |
| Commercial printing, lithographic | 1,810 | 2,314 | 3,049 | 3,315 | +1,505 |
| Engraving and plate printing | 39 | 37 | 42 | 40 | +1 |
| Manifold business forms | - | 20 | 107 | 109 | +109 |
| Blankbooks, bookbinding | 742 | 691 | 689 | 687 | -55 |
| Typesetting | 135 | 126 | 149 | 147 | +12 |
| Photoengraving | 243 | 207 | 176 | 175 | -68 |
| Electrotyping and stereotyping | 86 | 83 | 49 | 46 | -40 |
| Total | 10,258 | 10,886 | 11,141 | 11,277 | +1,019 |

Source: Wisconsin Unemployment Compensation Department

(3) Among printers, especially SIC 2752, Lithographic, establishments differed as to operations which they performed themselves and those they contracted for. For example, some contracted for all of their plate-making from other companies, while others had their own plate-making shops. A few of the latter also made plates for other establishments. As a result, the occupational distributions of establishments within the SIC group differed widely.

(4) Some establishments engaged in activities in addition to publishing and printing. For example, one of the establishments in SIC 2751, Job Printing, which has 59 percent of the employment in that group, is engaged in paper converting. They produce job order printed paper and plastic containers. They may be properly classified because they produce job order printed products, yet most of their employment is engaged in plastic forming and paper converting. Any extension of a sampling of this establishment would reflect a disproportionate amount of paper conversion and plastic trades in the printing and publishing industry. It would also underestimate the number of persons engaged in printing trades. This holds true in other SIC codes, such as 2761 (Manifold Business Forms) and 2782 (Blankbooks and Looseleaf Binders), in which some firms are engaged in paper conversion activities and others are not.

(5) During the course of the expert interviews, it was brought out that a considerable amount of printing is done by establishments outside the 27 SIC major group. This is especially true of the paper container industry.

The above five examples demonstrate the range and complexity of the problems that were found during the experiment of using the SIC code to describe the firms characteristic of the Printing and Publishing industry. An industry grouping by method of printing rather than product would provide a better base for the occupational analysis.

## 2. Unfilled Openings--Occupational Outlook Handbook Study

The public Employment Service offices in the Milwaukee SMSA place relatively few people in Printing and Publishing establishments; most workers find their jobs in the industry through the Graphic Arts

Association or the union. Therefore, the Unfilled Openings-Occupational Outlook Handbook method as tested by PROJECT VISION could offer little help in support of this experimental method.

### 3. Staffing Schedules, Wisconsin Occupational Analysis Field Center, 1962 and 1967

Basically, the Industry Expert approach was designed in large measure around the data which could be provided by the Wisconsin Occupational Analysis Field Center schedules. Potentially very useful because of their content, in actuality the schedules do not lend themselves to a statistical presentation of occupational trends. The Field Center's objective is to obtain information on all occupations involved in an industry and it needs only a sample of each. Such sampling of occupations, although ample for their purpose, does not result in an adequate sampling for any kind of quantitative study such as was undertaken by PROJECT VISION. Available staffing schedules did not cover all significant sections of the industry. For example, there was no schedule for any book-publishing firm. Almost as limiting was the meager representation of other segments of the industry, schedules frequently being available for only a single establishment. It was here in the scanty industry representation that the composition of certain SIC groups was found to be a particular handicap. Since the establishments in any one group are frequently not occupationally homogeneous, this limited sampling of establishments did not lend itself to extension. Moreover, the limited quantitative data precluded the comparison of the results of this approach with those of the area Employer Needs Survey (Chapter IV) and the BLS Occupation-by-Industry Matrix (Chapter VIII).

### 4. Industry Expert Interviews

In order to understand the factors behind past trends and to gauge the likelihood of their continuing in the future, interviews were held with experts in the industry. Valuable information was obtained from plant managers and personnel managers in several representative firms. Members of the Graphic Arts Association and staff members at the Milwaukee Journal were most cordial and helpful. Their expertise was particularly helpful in developing a meaningful interpretation of the overall employment trend data, and offered PROJECT VISION insights from several points of view.

## Findings

Although the numerical data were on the whole inadequate for specific occupational trends, this experimental undertaking furnished some trend information concerning the direction of employment activities involved in Printing and Publishing. These findings are presented below with reference to broad occupational areas:

1. Total employment in the Printing and Publishing industry has increased from 10,260 in 1961 to 11,280 in 1966. This was primarily due to increases in newspaper distribution (SIC 2711) and lithographic processes (SIC 2752), which more than offset the decline in letterpress (SIC 2751). It must be kept in mind, however, that these totals include an undetermined number of employees engaged in plastic-forming and paper-converting activities and do not include those engaged in printing activities employed by the paper-converting industry.

2. There was a marked increase in lithographic processes, illustrated by the fact that Milwaukee SMSA employment in firms primarily engaged in lithographic work grew from 1,800 in 1961 to 3,300 in 1966. The increase was expected to affect such trades as lithographic artist, lithographic pressman, and lithographic plate-making trades. All indications were that this trend would continue.

3. Competition from lithography reduced the number of persons engaged in letterpress processes. Employment in Milwaukee area firms engaged in such processes declined from 2,700 in 1961 to less than 2,000 in 1966 (the actual decline is greater because some paper-converting activities are included in the total). The decline affected such trades as photoengravers, electrotypers, and stereotypers. However, it was expected that this trend would not continue. Experts believed that nearly all feasible conversion to lithographic processes had been accomplished, and that future demand for workers in the occupations involved would remain static.

4. Conversion of some processes to numerical control eliminated some typesetting and composing occupations and initiated a demand for programmers and related computer occupations.

5. Record sales were being experienced at the time of the study in products related to gravure, silk screen, and flexographic printing processes. Workers in related occupations were expected to be in continuing demand.

6. The newspaper industry had not significantly increased its demand for printing trade workers but had increased its distribution and overhead employment.

## Recommendations

The analysis of the source data for this experiment led to the conclusion that the Industry Expert approach as undertaken by PROJECT VISION requires some changes in format and more information than was available for the study of Printing and Publishing. The recommendations arising from this initial effort follow. They are made with the Printing and Publishing study in mind, but the principles are applicable to any special industry study.

1. In this approach, only one industry (such as Printing) should be studied at a time. While there is an economic relationship between Printing and Publishing, they are occupationally dissimilar and should be treated separately in sampling, data collection, and for any dialogue with vocational education personnel.

2. Sampling units should be revised into units reflecting activity rather than end product. Information to do this can be obtained from staffing schedules and directories, and by canvassing establishments by telephone.

3. In areas in which staffing schedules do not furnish adequate sampling, an occupational analyst should contact additional establishments to acquire the information necessary.

4. Major paper-converting establishments should be canvassed to obtain a breakdown of their printing activities.

5. A larger number of industry experts should be interviewed in order to cover persons knowledgeable in each process or activity involved in the industry.

PROJECT VISION did not follow through on these steps because of limitations of manpower and time. However, the experience with the Printing and Publishing study does indicate that the Industry Expert approach can generate accurate current data on occupations peculiar to a given industry and can provide information on general trends affecting these occupations. At the same time, the results suggest that it is not feasible to attempt quantitative projections using this approach.

These tentative conclusions were strongly supported by a second special industry study conducted by PROJECT VISION -- a study of the Metal Casting industry, which also used the Industry Expert approach. The remainder of this chapter is devoted to a detailed account of the Metal Casting industry study.

## Metal Casting Industry

### Evaluation

The Industry Expert approach for the Metal Casting industry undertaken by PROJECT VISION resulted in certain reservations about this technique as an approach to the quantitative study of occupational trends and projections. These reservations were much the same as those for the similar approach to the Printing and Publishing industry. However, at the same time more positive results were obtained which could lend themselves to broader application.

The primary difference that brought about this greater potential usefulness of the results of the Metal Casting industry study for vocational education planning purposes lies in part in the differing nature of the two industries, but more especially in the effective modification of the 4-digit SIC groups within Major Group 33, Primary Metal Industries, for the purpose of obtaining subgroups in which occupational patterns would be similar. It will be remembered that serious problems arose in the study of the Printing and Publishing industry because Major SIC Group 27 was found to be too heterogeneous to provide a well-defined base for occupational projections. As studied by PROJECT VISION, the Metal Casting industry became a relatively clear-cut, activity-oriented industry which provided a homogeneous base for the application of a number of experimental techniques.

In contrast to the study of Printing and Publishing, it was possible therefore to construct a complete occupational matrix for the production employees; to use the data in conjunction with the Unfilled Openings--OOH Method; within limits, to compare the results with those determined by the area Employer Needs Survey; and, finally, to develop occupational trends and projections for vocational education purposes. Paralleling these observations is the adverse conclusion that the technique is too refined and too costly to use to determine trends for occupations that are characteristically found across the board in most industries, for example, clerical workers and administrative employees; and that it does not lend itself well to quantitative projections, inasmuch as it is inherently dependent on the qualitative judgment of industry experts.

## Scope and Methodology

PROJECT VISION conducted a specialized study of manufacturing methods, occupational structures, and employment trends in establishments in the Milwaukee SMSA engaged in casting metal, including foundries and die, centrifugal, and permanent mold casters. The study included an intensive review of the metal casting industry, its methods of manufacture, materials used, and products, to acquire background information; research to identify and classify all Milwaukee SMSA establishments engaged in metal casting activities; and personal and telephone interviews to develop an occupational matrix and to learn the trends, forecasts, and training needs of the industry.

The coverage of the industry was truly comprehensive. The occupational matrix, developed from data for 50 establishments chosen to be representative of the industry in the area, was extended from a sampling of 79 percent of the employment in the industry. This was a larger sample than necessary but was designed to attain as great a degree of accuracy as possible in this experimental study in order to assist in the evaluation of other methods tested by PROJECT VISION. The detailed occupational matrix appears on Worksheet II, Appendix E (pp. E3-E4). It is designed with a stub that lists the type of Metal Casting establishment in which the array of occupations (entered in the column headings) were found.

Heavy manual work was characteristic of the bulk of the jobs. Entry occupations requiring little or no prior training made up slightly over one-half of the almost two dozen identified occupations in the industry.

Contacts were made with a wide range of personnel such as company presidents, technical directors, engineers, training directors, and industrial relations and employment managers. The coverage included an intensive sampling by activities of foundries and die, centrifugal, and permanent mold casters, and a canvass of all establishments which have captive metal casting operations. Additional material taken into consideration included incidental studies of turnover in the industry, overall employment changes in the six years prior to the study, and a job shift study from application cards in the Milwaukee District Employment Service office.

The study was designed principally to

> evaluate the Industry Expert approach and compare results with other occupational projection methods tested by PROJECT VISION, particularly the area Employer Needs Survey;
>
> evaluate the SIC as a basis of sampling versus sampling by industrial activity; and
>
> develop methods of presenting occupational information to vocational educators.

Other undertakings embodied research into the type of information which can be obtained, time and cost factors, and the degree to which employers' cooperation (or resistance) might be expected. The development of an industry-occupational matrix for the Metal Casting industry was also an important product of the study.

## 1. Preliminary Work

Before beginning the study, the following preliminary work was carried out:

a. Textbooks were read which described the methods of manufacturing castings. Articles in trade magazines relative to change in methods and new developments were also reviewed.

b. A tentative subclassification of manufacturing establishments by casting methods and metals was developed to obtain sampling groups in which occupational patterns would be similar. In some classifications, 4-digit SIC groups served this purpose; in other cases the SIC grouping was not applicable because of dissimilarities of establishments included in these groups. The classifications developed were:

| | |
|---|---|
| Gray Iron Sand Foundries | SIC 3321 (except one shell molder) |
| Malleable Iron Sand Foundries | SIC 3322 |
| Steel Sand Foundries | SIC 3323 |
| Stainless Steel and Ferrous Alloy Sand Foundries | Operations found under various SIC codes |
| Non-Ferrous Sand Foundries | Some establishments in SIC 3361 and 3362 |
| Permanent Mold Casters | Some establishments in SIC 3361 |

| | |
|---|---|
| Die Casters | SIC 3369 and some establishments in SIC 3361 |
| Centrifugal Casters | Some establishments in SIC 3362 |
| Other Metal Casting Establishments | Various SIC groups |
| Investment Castings | |
| Shell Mold Castings | |
| Precision Plaster Mold Castings | |
| Metal Sign and Art Mold Castings | |

c. A list of metal casting establishments in the Milwaukee SMSA using the Unemployment Compensation listing of establishments by SIC code was prepared.

d. A list of product-manufacturing establishments, classified under SIC codes other than 33 Group, which operate captive foundries or perform metal casting operations, was compiled. The list was developed from the classified telephone directory, Employment Service records (both order file and employer records), manufacturers' directories, and local Employment Service office industry intelligence.

e. Preliminary research into the activities of all establishments was undertaken, using the sources mentioned above, to classify them according to activity-oriented sampling groups. At this point, it was found that the original listing required some modifications because some of the establishments cast more than one type of metal or used more than one basic method -- for example, die casting and permanent mold casting, or sand mold and centrifugal casting. As a result, the list was used as a criterion for selecting a sample, which in turn was modified as described later under Statistical Procedures.

f. A list of industry experts to be interviewed was prepared, based on manufacturers' directories, local Employment Service intelligence, and recommendations from the Chamber of Commerce and the Milwaukee Vocational School.

g. A list of "key questions" necessary to establish present and future trends in the industry and associated training needs in the industry was developed.

h. An expected occupational structure for each of the basic activities in the industry was prepared. This structure was divided into three categories for which the potential value of this study could be tested:

(1) Interindustry occupations which are found throughout a labor market area such as clerical occupations, material support occupations, and accounting occupations.

(2) Occupations which are found in large segments of the Milwaukee SMSA such as welding occupations, mechanical maintenance occupations, machine occupations, and heat-treating occupations.

(3) Occupations peculiar to the Metal Casting industry, or occupations represented in the Milwaukee SMSA primarily by workers in the Metal Casting industry. This category included the following occupations, listed with related DOT codes:

| | |
|---|---|
| Molders, Bench, Floor -- Loose Pattern | 518.381 |
| Machine Molders | 518.782 |
| Coremakers, Bench and Floor | 518.381 |
| Coremakers, Machine | 518.885 |
| Die Caster I (set-up men and set-up operator) | 514.380,<br>514.782 |
| Die Caster II (operate only) | 514.885 |
| Permanent Mold Caster (set-up operator) | 502.782-caster |
| Permanent Mold Caster (no set-up) | No DOT title or code |
| Centrifugal-Casting Machine operator (set-up) | 514.782 |
| Centrifugal-Casting Machine operator (no set-up) | 514.885 |
| Plaster Pattern Molders | 693.381 |
| Shell Molder (set-up) | No DOT Title or code |
| Melters and Smelters | Cupola Tender 512.782<br>Furnace Tender 512.885 |

## 2. Sample Selection

A total of 50 establishments was chosen for the sample. The selection of firms for each of the basic subindustry classifications was based on the criteria briefly described below.

### a. Size of Establishment

Unemployment Compensation employment data were used as an indicator of employment of each establishment. A representative sampling by size of establishment for each activity was adhered to. Since available data gave no indication of employment (or, in some cases, nature of activity) of captive operations, a canvass of all establishments was made, usually by telephone. In almost every case a breakdown by occupation was readily available and was obtained.

b. Length of production runs (jobbings versus high production).

c. Size of castings produced.

d. State of technology.

### e. Multiple Operations

Wherever an establishment was engaged in more than one casting method, or type of metal cast, data on all operations were obtained. All such establishments were included in the sample.

### f. Employer Needs Survey Firms

All respondents to the Milwaukee SMSA Employer Needs Survey were included in the sample in order to validate responses in that survey. In many cases, observations were made of operations to validate further and standardize responses from the Metal Casting firms.

### g. Special Sampling Problems

There were some special problems encountered in metal casting which required special care in sampling:

(1) Brass and aluminum sand casting were generally found in common association, done by the same workers and same equipment. These had to be combined.

(2) Stainless steel was integrated with many operations -- steel, non-ferrous casting, and ferrous alloys. A separate classification was found not to be feasible; thus care had to be taken to keep a proportionate sampling of this activity.

(3) Malleable (and ductile) and gray iron were frequently found in association, and were therefore grouped. However, the final sample of gray and malleable iron foundries contained an almost identical percentage of each.

(4) "Other metal casting" establishments had only a few small establishments in each activity. All were surveyed.

## 3. Industry Expert Interviews

Representatives from many of the 50 sampled establishments were selected for industry expert interviews by the criteria set out above and by their position in the firm, in order to obtain a sampling of opinions from various points of view. Included were company presidents, controllers, plant managers, employment managers, industrial relations directors, technical directors, training directors, plant engineers, and metallurgists; one market research director was included. In all, contacts were made with 45 persons.

## 4. Survey Techniques

A number of methods were employed in carrying out the survey:

### a. Personal Visits

The method most frequently used was that of personal visits, usually by appointment. These visits had three purposes:

(1) To obtain a statistical breakdown of occupations. In a personal visit, each company job title could be discussed and clarified to ensure standardization for statistical compilation.

(2) To tour plant areas for actual observation and analysis of occupations not easily identifiable by interview or telephone.

(3) To interview industry experts to obtain information on trends of business, on materials, methods and machines used, and effects on occupations and training required.

b. Telephone Contacts

Telephone contacts were made experimentally to determine whether information could be acquired with less time and expense than a personal visit. Accordingly, telephone contacts were used:

(1) To canvass establishments believed to have captive casting operations to determine the number of persons involved, the manufacturing method and equipment used, and the nature of the materials and products.

(2) To acquire an occupational schedule for each type of establishment.

(3) To determine the nature of casting activities of each establishment.

(4) To test the potential of telephone contacts in interviewing industry experts.

(5) To substitute for interviews in a few instances in which appointments were difficult to arrange.

c. Completed Employer Needs Survey questionnaires were reviewed, and questionnaire responses were compared with results of the personal interviews. All discrepancies were classified. Unusual patterns and/or other information received, such as projected changes in employment, replacement needs, training, or emerging occupations, were discussed to determine the factors involved.

d. Information was sought for the occupational matrix in accordance with the following format:

(1) Total employment of establishment (or total engaged in casting activities in the case of a captive operation)

(2) Nature of casting activities of the establishment:
Metals cast
Method and machinery used
Range of size of castings produced
Length of production runs
Markets and/or uses of products

(3) Division of employment between overhead and direct production activities. Except for technicians, overhead occupations are of an interindustry nature and no occupational breakdown was requested.

(4) Production employment data by occupation and by skill level as related to training needs. For example, a distinction was made as to whether or not die casters were required to set up their machines. Workers involved in activities not requiring specialized training for entry were grouped together.

(5) For skilled trades and operatives, tasks performed were reviewed. For example, were maintenance mechanics required to machine parts? perform structural layout and weld? do their own electrical wiring?

### e. Expert Interviews

Industry experts were interviewed but a structured format was not followed. Early in the study it was apparent that this would not be feasible because of the differences in the orientation of persons interviewed, the time allotted for interview, and the manner in which individuals understood and responded to questions. In some cases, the experts "took off" on their own and furnished a considerable amount of information voluntarily. Generally, the following information was sought:

(1) Present and projected trends in growth of their segments of the industry.

(2) Possible differences in changes in the firms in the Milwaukee SMSA and industry as a whole.

(3) Possible differences in trends between the activities for which they could speak and other branches of the casting industry and/or potentially competing manufacturing methods not related to this industry.

(4) Changes in manufacturing methods and occupations related to such methods.

(5) Trends and possible changes in demand for each of the more significant occupations in the industry.

(6) Trends in equipment, machinery, and capital outlay and their effects on employment, occupational distribution, and training needs.

(7) Existing training facilities for significant occupations and present and future changes in training needs.

(8) Employment problems (job vacancies, turnover, training problems).

(9) Basic factors affecting all present and future trends.

## 5. Supplementary Studies

As the study progressed, certain factors required further investigation. Therefore, the following supplementary studies or contacts were made:

a. High turnover in the industry, especially among employees in entry occupations, was frequently reported as a serious problem. This is also a demand factor in projecting future job opportunities and potential areas for training. Therefore, a study of the relative labor turnover of the different types of establishments was made. This was done from Employment Service records for all labor market information-reporting establishments over the 4-year period 1963 through 1966, the latest year for which such data were available. A description of this method follows:

(1) Annual separations for four years were added to annual accessions for four years. From this sum was subtracted the net change in employment, and the resulting figure divided by eight. This yields an average turnover per year.

(2) The average turnover per year was divided by the average annual employment for the four years to provide average annual turnover rates.

The above method provides a relative comparison of turnover rates for the different types of establishments. By subtracting net change in total employment for any one type of establishment over a 4-year period from the total of the four annual separations and the four annual accessions, the effect that varying growth rates in the employment in the different types of establishments has on turnover rates was eliminated (Worksheet I, App. E, p. E2).

b. Pertinent to the turnover rate were indications that many workers who quit jobs in metal casting establishments left the industry entirely. Employment Service interviewers reported that many former foundry workers were employed as construction workers and longshoremen. An analysis of selected Employment Service application records of construction laborers and longshoremen who registered for unemployment compensation during seasonal layoffs confirmed this. Application cards were examined to determine the proportion of such workers leaving a foundry or other casting establishment to accept outdoor work.

c. The Milwaukee Vocational School was interviewed in order to study foundry training facilities and curricula in foundry training, and to determine the particular information relevant to the industry needed for vocational education purposes.

d. Contacts were made with the local foundrymen's association and with the only manufacturer of foundry equipment in the area. The former resulted in a referral to a person already approached; the latter furnished no information which had not already been acquired.

## 6. Statistical Procedures

It was the intention of this study to apply the simplest possible statistical procedures in order to develop a model which would not require an expert statistician for its implementation. The steps taken to utilize and expand data were:

a. The first step was to arrange all independent metal casting establishments according to their activities, and to total the employment reported for March 1967 on the Unemployment Compensation report. The categories used for statistical analysis were:

Iron Foundries (gray, malleable, and ductile iron)
Steel Foundries
Non-Ferrous Foundries
Permanent Mold Foundries
Die Casters
Centrifugal Casters
Miscellaneous Casters (these were canvassed separately)

b. The independent establishments, excluding captive operations, actually sampled were similarly grouped; estimates of their employment, adjusted for early 1968 (the time of the study), were totaled for each category.

c. The percentage change in sampled establishments from March 1967 to time of survey (early 1968) was applied to the 1967 employment totals derived for each of the categories in the first step (a) above. This adjustment in the totals of each category resulted in a more accurate representation of the universe at the time of the study. It was assumed that employment trends of unsampled firms were similar to trends in sampled firms engaged in the same specific activities.

d. The "overhead" employment (administrative, professional, and clerical) in sampled establishments was totaled for each category. The percentage was applied to the universe and deducted from total employment so that the remainder reflected the number of production employees in each category. In one case, one of the "independent" foundries sampled was a foundry plant of a product manufacturing establishment located outside of the Milwaukee SMSA, and did not have a representative administrative staff. The employment of this plant was excluded from the sampling and later added to the total.

e. Totals for each occupation of sampled establishments were added for each category of establishments and extended to the universe.

f. Establishments engaged in activities contained in more than one category presented a special problem. The total number of production employees engaged in each activity was easily obtained from company records or known by the person interviewed. This employment and the totals for each occupation were posted under the totals of independent establishments for each category. The overhead employment was prorated to each category on the basis of value of manufacture (not shop employment).

g. All captive metal casting operations of product manufacturing establishments were canvassed. All production employment by occupation was posted under the appropriate category of establishment and totaled. Totals were added to the total of independent establishments for each category, thereby establishing an occupational matrix for each activity in the industry. Office and overhead employment attributable to captive metal casting operations was estimated by some establishments; for other establishments, estimates were made on the basis of known percentages.

h. Addition of total employment and employment by occupation for each establishment category furnished an overall estimated occupational matrix in the Milwaukee SMSA.

## Findings

As the study of the industry evolved, it became a vehicle for testing the practicality of various approaches to the study of a single industry for the purpose of determining occupational trends and projections for use by occupational education planners. The information acquired consisted primarily of current employment in all basic categories of the Metal Casting industry and a wealth of expert commentary regarding trends in the industry as a whole, its manufacturing methods, trends in occupational distribution, recruitment methods, replacement needs, and occupational training problems. The statistical information, especially as it relates to qualitative responses derived from interviews, requires interpretation and qualifying explanations. Therefore, a lengthy report of findings is submitted, together with related worksheets, in Appendix E.[7]

The remainder of this chapter concerns the comparison of this Industry Expert approach with some of the other techniques tested by PROJECT VISION, a brief discussion of costs, and concludes with general comments on the findings and several recommendations. The comparisons follow.

### 1. Comparison With Unfilled Openings-Occupational Outlook Handbook Method

A test was made between the two methods for two occupations: coremakers and molders. The Unfilled Openings-OOH Study used

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[7] Worksheet II, Appendix E (pp. E3-E4) presents statistical information covering employment in the Metal Casting industry, including an occupational matrix of occupations significant to the industry.

Worksheet III, Appendix E (pp. E5-E11) presents a statistical classification of some of the important comments acquired through the expert interviews.

Employment Service orders and DOT coding as a unit.

a. Coremakers

The UFO-OOH study combined skilled and semiskilled machine coremakers. The results indicated a continued need for coremakers with a high intensity of shortage and moderate growth.[8] In general, the expert interview study followed a similar finding, but differentiated between skilled and semiskilled levels. The intensity of shortages was in tradesmen; the growth was questionable, and primarily for lower skilled machine coremakers.

b. Molders

Similarly, the UFO-OOH study combined tradesmen with machine molders and indicated less than 30 openings and 50 percent intensity. The fact that it was easier to place machine molders obscured the difficulty in placing skilled molders; thus the intensity factor loses its meaning. The OOH forecast was borne out by the industry study.

These two examples indicate that a more careful distinction of occupations should be made on an Unfilled Openings--Occupational Outlook Handbook study to tell the entire story. If the occupations or levels within one occupation are so different that a specific type of training is required for each, such a study loses considerable value. An occupational classification system which is more definitive than DOT 3-digit codes might be necessary.

The projection for the growth in demand for metal casting production workers in the two studies was found to be comparable with the exception of coremakers. For that occupation, some question arose during the expert interviews as to the anticipated "moderate increase."

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[8] "Intensity of shortage" refers to the proportion of Employment Service job openings in an occupation remaining unfilled for 30 days or more for which workers could not be found despite intensive search. For a fuller discussion of this concept, see Chapter VII, The Unfilled Openings--Occupational Outlook Handbook Approach.

## 2. Comparison with the Employer Needs Survey

Worksheet IV (Comparison of Sampling by Activity vs. Sampling by SIC, App. E, p. E12), gives a comparison of data acquired in the Industry Expert study (activity) with data acquired in the Milwaukee SMSA Employer Needs Survey (SIC) for occupations peculiar to the Metal Casting industry. It can be seen that there were wide variances between the three occupations covered by the survey (skilled molders, machine molders, and skilled coremakers) and the matrix developed by this study. The greatest part of the difference was due to response error, that is, employers were found to have entered data under the wrong occupation. Interviews with employers and some job observation revealed these errors, and corrections were made to reduce the variation. However, some variation remained because of response patterns and problems which arose from using the SIC as a sampling unit. (See discussion of limitations in use of SIC groups under Scope and Methodology: 1. Preliminary Work (a), p. 118, and (e), p. 119.)

An anticipated growth in skilled molders which was reflected in the Employer Needs Survey was not brought out in the expert interview study. When persons who filled out the forms were asked why the differences occurred, their comments revealed that some used the forecast to reflect current shortages, and some simply prorated overall employment to all occupations. The same explanation also seemed to apply to coremakers.

## 3. Turnover Rates

The average annual turnover rates, as prepared from the Employment Service records, provide a seemingly valid base for comparing the experience of the different types of metal casting firms. Worksheet I (App. E, p. E2) presents the data, which give evidence of wide variation within the die casting establishments and non-ferrous foundries. A narrower range is evident in iron and steel foundries. This type of analysis is far more useful than the results of the Industry Expert approach to the same question.

As far as replacement needs were concerned, the Industry Expert approach primarily turned up only two pieces of information: "Tradesmen are getting old," and "Vacancies are hard to fill." Intensive interviews did reveal, however, that some employers based "replacement needs" on expected retirement and others on total turnover when answering the skill survey.

## 4. General Comments

a. The Industry Expert approach has little value in obtaining information regarding occupations which have a broad interindustry application. Data gained from using this method reveal only the trends and application of such occupations in a small segment of the economy; therefore, it reveals little of value to those who need information for purposes of training or related planning. (What good is it to know that an industry which employs one percent of a given occupation will need 5 percent more in three years?)

b. The Industry Expert approach can also develop a comprehensive, accurate picture of occupations primarily found within the activity studied, including trends, changes in number, changes in vocational knowledge required by the workers, and projected changes in training needs.

c. A study of this type does not require an expert statistician. Utilization of basic arithmetic plus a fundamental understanding of statistics including knowledge of sampling techniques.

d. This type of study does require a person who has some knowledge of occupational analysis, has some understanding of his local industrial community, and has (or must prepare himself by gaining) an intensive knowledge of the industry to be studied. In a very large SMSA, the latter two requirements could present a problem.

e. Employer response to this study was excellent. The industry representatives interviewed appreciated the interest shown in their industries, were glad to express themselves, and were most cooperative. Not one person approached refused to furnish the information requested, despite the fact that a number of persons were interviewed whose firms had not responded to the Employer Needs Survey.

f. It is difficult to estimate costs for a study such as this. It must be kept in mind that this was a multiple-purpose study primarily aimed at developing a method. Many more contacts were made than were necessary. A well-selected sampling under 50 percent could have resulted in reasonable accuracy. It was also found that most personal visits could have been telephone contacts instead. The latter were used experimentally and found to work very well. It is estimated that this study could have been completed in 25 man days and for $65 traveling costs.

## Recommendations

The Industry Expert approach has considerable potential for accuracy in gathering current data within a limited industrial activity. It also has considerable value in obtaining qualitative data on industrial occupational trends. However, this approach has value only for a study of occupations peculiar to the industrial activity studied.

The following are a few specific recommendations:

1. A study of this type should be made only if information is needed within a limited industrial activity which employs all or most of the workers in the occupations in question.

2. Company presidents (including owners of small firms), manufacturing engineers, and market analysts appear to be the best sources of information regarding industry trends and trends in manufacturing methods and occupations which relate to them.

3. SIC 4-digit groups do not always work well as sampling units for occupational information. It appears that more effective sampling units could be worked out by some rearrangement of the SIC. This is an area for further research.

# CHAPTER VI

# EMPLOYER-BASED DATA AS A MEANS OF IDENTIFYING EMERGING OCCUPATIONS

## SUMMARY

Emerging occupations are an important element in a model system of occupational information for planning and developing vocational education curricula. Could the data obtained from the Milwaukee SMSA Experimental Employer Needs Survey yield reliable evidence that production methods in some area industries would change in the subsequent 3- to 5-year period to a degree that would necessitate the recruitment of qualified workers from outside the plant who had acquired new, and therefore specialized, skills?

Although it would have been most desirable and informative to have followed the returns from the mail questionnaire with in-depth interviews with selected employers on many aspects of this question, it was not feasible in terms of time or funding. Short of that, three techniques were used to analyze the already assembled data with results that indicate promising areas for further study.

Perhaps most important was the finding that the Area Skill Survey questionnaire as currently structured does not lend itself to the identification of emerging occupations to any useful degree. However, PROJECT VISION suggests that in the future the questionnaire might be tailored more adequately to achieve this purpose. It also recommends that plans for an extensive follow-up should most certainly be incorporated in the overall survey design.

Among the recommendations for improving the usefulness of the questionnaire for this specific purpose is one particularly related to the presentation of the occupational listing for the employers' use. Although in the pretest employers had had an opportunity to suggest occupational titles to be included, some of their current interests and even occupational needs were not represented in the final form. It is suggested that this in itself may be evidence of emerging occupations. It is perhaps even more indicative of need for greater communication between employers and Employment Service staff with a view to achieving more generally useful and acceptable occupational terminology. Vocational education representatives

should most certainly be vital contributors to the effort to resolve the occupational classification or language problem to the mutual benefit of those responsible for vocational education training.

Interviews with selected employers regarding their in-plant training programs indicated that vocational educators could expect to find valuable suggestions for program planning in the results of a comprehensive study of such plans if it could be developed on an area-wide basis.

The most specific result of the study of the questionnaires immediately pertinent to the development of vocational education curricula was the evidence that the following occupations could be considered as "emerging" in the Milwaukee SMSA: electronic instrument repairman; business machine repairman; extruding machine and molding machine operators in plastics establishments. "Possibly" emerging occupations were most of the data-processing occupations and repairmen of mechanical instrument and data-processing equipment. The occupational fields of inspection and quality control are recommended for inclusion on Area Skill Survey questionnaires because their increasing importance in many establishments was indicated to PROJECT VISION by employers.

## SCOPE AND METHODOLOGY

"Emerging occupations" is a fairly broad concept as used in the Area Skill Survey technique and it is recommended in the Handbook that it should be taken into consideration in the process of selecting occupations for which data are to be obtained. Such occupations in this sense are essentially those expected to require a sizable number of workers in the future, but which at the time of the survey have few, if any, workers employed in them.[1]

Experience has shown that this component of the survey has seldom been successfully used, and even less often has its use obtained meaningful results. In part, this inadequacy is the result of the way in which the Area Skill Survey attempts to elicit information concerning such occupations from employers. The Handbook suggests that inquiries into the existence of such occupations be made by asking each employer included in the sample to answer the following question:

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[1] U.S. Department of Labor, Bureau of Employment Security, Handbook on Employment Security Job Market Research Methods, Area Skill Survey, BES No. E-252 (GPO, Nov. 1965), p. 6.

> What occupations that are new to your establishment or the area are emerging due to changes in process, automation or technological development?[2]

A short explanatory note is included which states: "Current employment in such occupations may be insignificant, or even nonexistent, but the growth potential is important."[3] While this brief note does attempt to define and clarify the word "emerging," there is little doubt that employers find it difficult to respond to the above question, and that the concept as presented to them requires further clarification in order to improve the quality of the responses.

PROJECT VISION undertook a roundabout investigation of this problem. The Experimental Employer Needs Survey questionnaire was not designed to include a direct request for a listing of emerging occupations, largely because it was quite complex and already included a number of requests for special information. However, it was decided to analyze various types of data generated by the survey in an effort to determine whether such data could provide clues to the identification of emerging occupations even if information on such occupations were not specifically solicited. In particular, interest centered in the additional occupational titles entered by the employers themselves on the open-end occupational stub, and in the significance of information obtained on those occupations not prelisted on the survey form.

Before entering into a presentation of the procedural and analytical aspects of this effort to identify the emerging occupations in the Milwaukee SMSA, problems thought to be inherent in the conceptual framework are discussed.

## Problems Concerning the Conceptual Framework

As demonstrated above, the Area Skill *Handbook* presents only a generalized concept rather than a precise definition of emerging occupations. As a result, it has probably been the prime source of problems and arguments that have arisen regarding the importance of such occupations within the labor market. Probably the greatest area of conflict exists with respect to the association of emerging occupations with new types of technology. After consultation with representatives of the Wisconsin Occupational Analysis Field Center, the set of conditions referred to by Norman Medvin in the Employment Service Review[4] was accepted. In this article, Medvin states the basic approach:

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[2] *Ibid*., p. 22.

[3] *Ibid*.

> It does not seem that the emerging occupations could have more than a slight impact on the job market for years to come. The fact of the matter is that job structure changes rather slowly and the overwhelming number of jobs and subsequent opportunities are in already existing occupations.[5]

And yet, the very existence of skill shortages seems to indicate that at some point in time changes do occur within the labor market that over a number of years have a rather drastic effect on skill requirements. As a result of these changes in a particular labor market and those that may occur in the general economy, various occupations do emerge -- not as totally new knowledge areas, but as areas that are receiving increased emphasis as a result of changing manufacturing processes.

With these thoughts in mind, the following attempts to identify emerging occupations were initiated. It was hoped to disclose occupations which could be shortage occupations in the years ahead unless in the near future necessary emphasis and perhaps vocational education programs are focused on them.

## Three Techniques Used To Analyze Experimental Employer Needs Survey Data

Early in the study it became apparent that for effective use an intensive follow-up would be required to supplement and validate the data obtained in the August 1967 mail skill survey. Limitations of time and staff ruled this out. However, it is thought to be useful to present a brief description of the substitute, more limited procedures followed and, based on the findings, a number of observations on the relevance of certain types of data to the identification of emerging occupations.

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[4] Norman Medvin, "Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting," Employment Service Review, 4, Nos. 1 and 2 (Jan.-Feb. 1967), 61.

[5] Ibid.

Initially, the analysis was based on an examination of occupational titles entered by the employers on the Survey questionnaires. In the survey, some employers were given questionnaires with open-end occupational listings, and were asked to enter all of the occupations themselves, guided only by certain major headings; for example, Administrative, Sales, Engineering, Service, etc. Other employers were given questionnaires with prelisted occupations, but were asked to list additional occupations in their plants that were growing, declining, or undergoing change. The analysis was to consist of comparing the occupational titles from the open-end questionnaires with the titles on the prelisted questionnaires in order to determine the differences between the two sets of titles and to evaluate the areas emphasized by employers in terms of their possible bearing on the question of occupational emergence.

As the study proceeded, an investigation of company training programs was undertaken as well. In the experimental survey, employers had been asked to list the occupations for which training was provided. It was thought that use could be made of this information on the assumption that technological change within these companies would impose certain manpower requirements that initially would be met from within the establishment through in-plant training programs.

A third approach also evolved. It consisted of piecing together many bits of information obtained from the Experimental Employer Needs Survey. The data included expansion needs, replacement needs, and the industrial groups in which a particular occupation was found.

By evaluating these three sources of data for a given occupation and applying local expertise in the areas of staffing patterns, existing skills, and occupations, it was believed that a list of emerging occupations could be derived.

## RESULTS

The review of titles on the open-end questionnaires and their comparison with titles on prelisted stubs provided no satisfactory results in revealing emerging occupations. The chief benefit was in pinpointing occupational areas which might have received more adequate coverage on the prelisted stubs. It was found, for example, that more titles should have been entered under "Clerical Occupations." However, it so happened that the inadequate coverage occurred primarily in areas which were not really relevant to vocational education training and, therefore, no fundamental loss was sustained in terms of the overall purpose of the special study. Limited emphasis had been given to administrative occupations on the prelist on the assumption that many executive and managerial positions would definitely be beyond the realm of vocational training.

Another difficulty revealed by the review was the fact that some occupations or occupational areas were emphasized by some employers which were all but passed up by others in the same industries. This cannot be said to be surprising in an open-end occupational questionnaire. More important, in terms of analysis, was the finding that employers listed such wide varieties of occupations, skills, and levels of complexity within the same occupational areas that the resulting data were extremely difficult to evaluate. These problems were especially apparent in processing occupations and in the general area of supervision and of inspection and quality control. Since headings had not been provided for the latter two areas on the open-end occupational stubs, the employers were not directed to enter these types of occupations. However, many employers did list such occupations in various parts of the questionnaires, indicating that they are of importance to employers and, therefore, that greater efforts might well be made to identify them in future studies. Here again, the supervisory occupations might be of doubtful relevance to vocational curriculum planning. On the other hand, the inspection and quality control occupations seemed of such significance to some employers that PROJECT VISION recommends further study of this occupational area for purposes of definition of skills and knowledge involved.

Since there is a good chance of finding emerging occupations among the three areas listed above -- processing, supervision, and inspection and quality control -- it would be advisable to explore these areas systematically by listing the relevant occupations on a survey questionnaire. In this way the chance employer listing could be tested for general applicability in a labor market area.

Probably the major reason for the inability to derive information on emerging occupations from the employers' listings is that very few employers recognize such occupations themselves. In other words, there is reason to believe that employers are not aware of the fact that new skills, changing job requirements, and training programs for new machines may all be evidence of what PROJECT VISION would describe as "emerging" occupations. As a result, a possible emerging occupation may simply be identified as "Machinist IV." Such a designation on a skill survey occupational stub only conceals the evidence sought. Thus, the changes in skills that might have indicated emerging occupations were not identified by distinctive job titles by employers. This would seem to be an important area which could benefit from future efforts to improve communication and terminology concerning a mutually accepted occupational classification that would have significance for vocational educators.

Turning from this initial effort, which was based primarily on direct written responses from employers, consideration was next given to employer training programs as a possible source of emerging occupations. A number of employers who stated that they had such programs were interviewed and asked to supply the following (for complete questionnaire, see App. D,p. D-3):

> The nature or type of instruction offered by the course.
>
> The duration and the number of graduates anticipated several years hence.
>
> Whether the purpose of the course was to upgrade workers into higher paying positions or merely upgrade their knowledge so that they could perform more efficiently.
>
> When the course was initiated, and for what reason.

The following list gives examples of the types of occupations for which employers offered training. Also included are the 2-digit SIC industry designation of firms in which these training programs were most frequently found.

TRAINING OCCUPATIONS

| OCCUPATIONAL TITLE | SIC INDUSTRY CODE |
|---|---|
| Electrician | 33, 35, 49 |
| General Office Clerk | 42, 63, 73, 91 |
| Machinist | 34, 35, 49 |
| Manufacturer's Representative | 33, 48, 50 |
| Mechanical Engineer | 34, 35, 50 |
| Millwright | 34, 35, 91 |
| Salesman | 50, 55, 63, 73 |
| Tool and Die Maker | 35 |
| Welder | 34, 35, 49 |
| Welder-Fitter | 35 |

None of the above occupations can be designated as "emerging" as the result of technological change. All of them have existed for many years, although such broad occupational titles certainly include variations which resulted from changes over a period of time. When asked why they had initiated such training programs, employers generally responded by saying that they had done so because of the lack of trained people in the labor market. The other reasons cited were (1) to familiarize employees with their product and industry (most often these were the sales occupations), and (2) to upgrade present employees to more responsible positions involving some supervision.

This brief analysis seems to indicate that employers are most likely to provide structured training programs to ensure an adequate supply of workers with those skills that are vital to their organization and not readily available in the labor market. This conclusion does give some merit to the argument that the skills and job knowledge required by technological change are most often passed on through informal channels such as on-the-job training. It is ironic that employer training programs were looked at in the hope of finding emerging occupations, while in fact the very informality of such training tends to obscure the adjustments in labor utilization which take place as a result of the evolutionary process by which technological innovations are developed and implemented. At the very least it would seem to be indicated that the Employment Service has an opportunity to perform a very real service in this connection. Assembled area-wide in-plant training program data could be expected to provide a useful tool for vocational education program planning.

The last and most productive attempt at uncovering evidence of emerging occupations involved using a combination of Employer Needs Survey data and local Employment Service expertise or judgment. Again, the limitation of time and the doubtful accuracy of the data for many occupations prevented an extensive analysis. Nevertheless, this attempt offered the first real glimpse of emerging occupations. The following factors were considered:

1. Expansion or growth in employment of a given occupation over the succeeding three years. (From this, yearly "expansion needs" were estimated. They were defined as additional workers needed because of plant expansion.)

2. Replacement needs per year for a given occupation. ("Replacement needs" were defined as workers needed to replace those who are promoted, die, retire, become disabled, or enter the Armed Forces.)

3. The extent to which a given occupation is found throughout the local economy.

The first step in this approach consisted of a comparison of expansion and replacement needs for a large number of occupations. The assumption was that if expansion needs were larger than replacement needs -- that is, if expansion needs were the largest percentage of total anticipated demand for a given occupation -- that this could be taken as an indication of an emerging occupation. From an analysis of the demand statistics of various occupations obtained from the Employer Needs Survey, it was found that expansion needs tended to be outnumbered by replacement needs for many non-emerging occupations. For example, expansion needs were only half as large as replacement needs for accountants, and only one-fifth as large as those for registered nurses. On the other hand, expansion needs were double the replacement needs for plastic and rubber-molding machine set-up operators, and were triple the replacement needs for mechanical instrument repairmen. According to this indicator, then, the latter two occupations could be said to be "emerging."

Since there was considerable reason to question the reliability of some of the replacement needs data, the replacement-expansion evidence was weighed against several other factors:

1. Total current employment in the occupation. The assumption was that current employment would be low if an occupation is emerging.

2. Industry dispersion. The number of industries in which an emerging occupation can be found would currently be few.

3. Short-term expansion. Growth over the shorter projection (3-year) period would be large if an occupation is emerging.

With these additional variables in mind, the data obtained from the area Needs Survey were reviewed again. The following occupations seemed to fit all of the previously established conditions and are, therefore, presented as emerging occupations in the Milwaukee SMSA on the basis of this limited analysis:

Electronic instrument repairman

Business machine repairman

Plastics Occupations
  Extruding machine operator
  Molding machine operator

Several other occupations could be placed in a "possible" emerging category. These include most of the data-processing occupations (more specifically, console operators) and repairmen in various other fields such as mechanical instruments and data-processing equipment.

## CONCLUSIONS AND RECOMMENDATIONS

The most obvious conclusion is that the identification of emerging occupations, for whatever purpose, obtained from employer data by means of the Employer Needs Survey questionnaire is difficult indeed. A few such occupations or occupational areas could be singled out when certain types of data obtained in the experimental survey were analyzed by local Employment Office occupational analysts. Examples of relevant data were those pertaining to current employment, replacement needs, the dispersion of occupations among different industries, and the projected growth of selected occupations over the 3-year forecast period. On balance, however, it seems apparent from the survey findings and analysis that the Area Skill Survey as currently designed simply does not lend itself to the identification of emerging occupations to a useful degree.

PROJECT VISION's investigation of company training programs and of occupations entered by employers on open-end questionnaires yielded little information that had any bearing on the discovery of emerging occupations. Perhaps more structuring of the questionnaire with this particular purpose in mind, and certainly a more extensive follow-up, could make these particular sources more meaningful. Nevertheless, it is suggested that the Area Skill Survey questionnaire is hardly the appropriate vehicle for this purpose.

Time is an important consideration in identifying emerging occupations for purposes of training, since there is usually an interval before these occupations have an impact on the labor market. In fact, on the basis of the findings in this analysis, the question can be asked whether there is a real need for early identification of emerging occupations from the standpoint of vocational training. Usually by the time such occupations have made an identifiable impact on the labor market area they have already become a part of the technological process through evolutionary development. Certainly, production did not stop while waiting for an "emerging" job to be defined and filled. The new skills have been learned and developed through on-the-job training whether or not they were labeled as "emerging." As a related point on the time factor, it should be emphasized that current Employment Service personnel resources are woefully inadequate and, therefore, unable to realize the potential from data which could come from a continuing close scrutiny of labor market needs for this purpose.

Finally, and importantly, although this analysis was limited in scope, it revealed a number of important variables which are recommended for consideration by others who may plan to undertake a study of emerging occupations.

# CHAPTER VII

# THE UNFILLED OPENINGS-OCCUPATIONAL OUTLOOK HANDBOOK APPROACH

## SUMMARY

PROJECT VISION, in its evaluation of different methods of obtaining workable estimates of worker demand by occupation in the Milwaukee SMSA, undertook to carefully assess the adequacy of the Unfilled Openings-Occupational Outlook Handbook approach (the UFO-OOH approach).[1] The technique, as set forth in the Employment Service Review for January-February 1967,[2] was put forward as an experimental approach to meet the then immediate need of the Employment Service for a viable means of discharging "its function of providing long-range occupational information to the vocational education system that would also serve the Employment Service itself in carrying out its responsibilities under the Manpower Development and Training Act."[3] PROJECT VISION recognizes that this technique has some of the advantages that the Employment Service was looking for, but considers that it does not produce well-rounded results because of its failure to take into account several elements of fundamental importance to a projected occupational supply-and-demand picture even when precision is not among the criteria on which it rests.

Without detailing at this point the several sources, the most auspicious aspect of this method is its strong reliance on readily available or easily assembled data. Most of these sources are within the confines of Federal and State government agencies. They include the valuable expertise of the local Employment Service staff on which the method relies heavily. Thus, it is possible in a relatively short period of time, on a recurring basis if desired, and at a minimum cost, to assemble large portions of the necessary basic data. This is in contrast to the standard Area Skill Survey technique which depends in the first instance on the cooperation and specialized knowledge of busy employers who, for the most part, are not prepared to furnish carefully reasoned estimates of their need for workers in specified occupations during a year or more ahead.

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[1] U.S. Department of Labor, Bureau of Labor Statistics, Occupational Outlook Handbook, 1966-67, BLS Bulletin No. 1450 (GPO, 1968).

[2] Norman Medvin, "Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting," Employment Service Review, 4, Nos. 1 and 2 (Jan.Feb. 1967), 61-74.

[3] Ibid., p. 64.

On the other hand, PROJECT VISION found that a substantive drawback to the technique, if it were followed as described in the Employment Service Review, was the lack of any provision for preparing estimates of the number of workers who could be expected to become available to meet the current and anticipated shortages in selected occupations in a given area. In this connection, an important component of the labor supply-demand balance sheet not accounted for was the estimated net gain or loss that was due to the in-migration or out-migration of workers attached to a given occupation for a selected time period. As in the case of one particular occupation in the Milwaukee area, the net in-migration of young trained workers from another labor market area could be an important supply factor acting to reduce a current or impending labor shortage.

As a result of PROJECT VISION's use-test of the UFO-OOH method and the development of certain additional data deemed to be necessary, it was concluded that the UFO-OOH technique is one of a number of labor market "indicators" that can be useful to vocational education planners if its limitations are recognized.

SCOPE AND METHODOLOGY

PROJECT VISION, using job vacancy and unfilled openings data for 1967, tested the technique for long-range occupational forecasting as described by Norman Medvin in the Employment Service Review.[4] Although this test in the Milwaukee SMSA focused on developing information for vocational education purposes, the data resulting from this technique are also useful for MDTA purposes, including development of the MDTA annual plan and training needs determination. An application to MDTA purposes can be achieved merely by including data for lesser skilled occupations which are not of import for normal vocational education information needs.

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[4] Ibid., pp. 61-74.

In addition to the formal test, PROJECT VISION developed supplementary procedures designed to construct the supply determinants for the occupations in which workers were judged to be in short supply and for which long-range planning was expected to be necessary in order to meet the need. These procedures are set forth in the form of a manual (App. I, pp. I-13-I-24) entitled "Addendum to a Short-Cut Technique for Making Local Long-Range Occupational Projections: The ES Unfilled Job Openings-Occupational Outlook Handbook Approach." The material presented in the manual is not part of, nor contemplated by, the technique as proposed by Medvin. Rather, it is an amplification of that technique.

A detailed description of the manner in which the formal test was carried out follows.

The test as it was conducted in the Milwaukee SMSA involved the collection and treatment of local Employment Service data on unfilled and hard-to-fill job openings. In this special study the initial step involved reconstructing unfilled openings data for the previous four quarters to obtain a set of basic data from which to work. From the basic data, occupations were selected according to a number of criteria as stated in the methodology contained in Appendix I (pp. I-1-I-12, "A Short-Cut Technique for Making Local Long-Range Projections.") In addition, other occupations were included which were found to be numerically important according to the 1960 decennial Census. Such occupations generate replacement needs which may require vocational programs even in the absence of long-term growth.

After the above occupational data were assembled, job vacancy data from a special survey made in the Milwaukee area were arrayed against the job openings. Ideally, the time period for which the job vacancy data are collected should correspond to one of the quarterly periods for which the job opening data are collected. This situation existed for the Milwaukee SMSA test. As a result of the comparison of vacancy data and the job openings data, a blow-up or expansion factor was obtained and used to develop estimates of the universe of "hard-to-fill" job openings in the Milwaukee area for the occupations selected. In a number of instances, data on occupations were missing or were considered to be unreliable. In these cases, generally resulting from underrepresentation in the ES job order files, further investigation was required. The additional investigation into areas of inadequate data was called a "gap" study.[5] The following comments concerning certain aspects of this study are of interest.

## The "Gap" Study

The nature of the information needed determined the source from which additional data would be obtained. For instance, since building trades occupations are subject nearly exclusively to union jurisdiction, the union was assumed to be the most fruitful source for ascertaining occupational opportunities in this field. On the other hand, specific data on growth trends in individual occupations resulting from technology are most likely available at the corporate engineering officer level of individual establishments.

Most of the interviews undertaken during the gap survey information program were at the personnel officer level. It was logical to make arrangements with a personnel officer in the first instance, regardless of the specific information needed, because he would be in a position to help set up appointments with other company officials. Also, much of the data on current demands and training and numerous other pertinent facts are usually readily available at the personnel level.

The following topics were explored during interviews or in other facets of the investigation into gap areas:

1. Clarification of occupational terminology used.
2. Present openings and those open over 30 days.
3. Training required for entry into the occupation and for advancement.
4. Location of available training facilities.
5. Training conducted by the firm for a given occupation.
6. Past experience factors in the occupation.
7. Supply sources for the occupation.
8. Reasons for shortage of job applicants.
9. Reasons for employment trends in the occupation.
10. New technology affecting this occupation, and the occupational structure in general.
11. Forecast, short and/or long-range, for demand for workers in the occupation.

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[5] A step-by-step explanation of the gap study procedure is covered in Appendix I, "A Short-Cut Technique," (pp. I-2-I-12).

## Findings of the "Gap" Study

It is generally agreed that the information given by a firm is not only specific as to that firm's position, but that it can also be considered to apply to other firms in the area which have a similar occupational mix. This point is especially pertinent in determining an occupational needs projection when the cooperating firm is known to have the area's most advanced technology. The advanced status of such a firm is a good indicator that their thinking foreshadows the trend in the industry as a whole.

It was disappointing, therefore, to find in this project that figures obtained from employers on the number of openings in gap occupations and the length of time they remain open were of little help in probing gap areas. In general, it was found that firms had specific data on their own operation but could offer no real enlightenment on the universe of a particular occupation. Each firm could furnish figures on its immediate employee needs for the occupation in question, but were unable to discuss their requirements in terms of overall demand factors -- past, present, and future. Likewise, they were not in a position to relate their future labor needs to the factors (wages, working conditions, applicant characteristics, etc.) that normally determine the supply of labor for particular occupations in the geographical area under study.

Terminology is often a stumbling block which prevents ready understanding. In the gap study, problems of ambiguity arose quite frequently in occupational discussions. It was often necessary to state the precise meaning of words such as "skilled," "tailor," "technician," "millwright," in a particular context. Also, it was difficult to ascertain the exact skill level (skilled or semiskilled) an employer was referring to when certain occupations were under consideration. The terminology problem was most striking in the machine-shop area where the large number of openings could be either skilled jobs requiring extensive training, or semiskilled occupations needing little preparation. The occupational listing in the quarterly unfilled openings studies, especially if a 6-digit SIC breakout is used, is helpful in determining whether employers are referring to skilled, semiskilled, or unskilled positions.

In a tight labor market such as that existing in the Milwaukee SMSA in 1967, many employers indicate that they are mainly interested in applicants who are trainable. By "trainable" it is generally meant that the applicant possesses the rudiments of communication skills, mathematics comprehension, and, equally important, the proper motivation toward the job. However, exploring this point with employers usually disclosed that they really desired applicants to be knowledgeable in certain particular areas in order to qualify for a job.

An interesting aspect of this approach was exemplified by a follow-up study of the tailoring occupation. Job order files showed little ES activity in this occupation during the period studied and no vacancy information. Also, at the time this report was being prepared, the local office had only one order for a tailor on file, and there was one newspaper advertisement requesting a tailor's skill. Yet, in approaching the various local businesses employing tailors, a good demand was found to exist. How does such a demand operate in the local labor market if no outward manifestation of it is apparent? In this instance, the Milwaukee Technical College bulletin presented a rather large curriculum for tailoring. It is reasonable to suppose that the college's trained workers were meeting the local demand. Similarly, dental and medical assistance occupations have extensive training prerequisites at the school and are probably among the growing medical field demand occupations. At the same time the demand for workers for these occupations, as in the case of tailoring job openings, was not evident in the study of the local ES job orders.

Another facet of the occupational supply-and-demand picture encountered in the gap study was wage structure and its importance to job stability and mobility. It is a truism -- but it bears repeating -- that some jobs, although demanding energy and creativity, do not attract enough people because the pay is poor in relation to other job opportunities available in a community.

It was also brought home quite strongly by several of the larger firms hiring technicians that there was a significant in-migration and out-migration of technical school graduates in the Milwaukee SMSA. Three large companies in the area recruit extensively in Chicago from a school for electronics technicians. It is important to bear in mind, in relating demand to supply in a given labor market area, that the problem of accounting for migration of workers can be imposing and requires careful consideration.

Returning now to the additional steps taken in the UFO-OOH procedures and some of the resulting findings, long-range national employment projections were obtained from the Occupational Outlook Handbook for each of the previously selected occupations. Difficulties were encountered in this phase of the study because of the many levels of complexity and skill represented in some of the OOH clusters of occupations. Efforts were made to adjust to the OOH whenever possible by rearranging unfilled openings data. Also, the BLS publication, "America's Industrial and Occupational Manpower Requirements, 1964-75,"[6] was used as a supplement to the OOH data in order to clarify specific projections and fill information gaps. The results of the initial test of this technique were published in a report, "Occupational Employment Information for the Milwaukee Job Market Areas" (App. I, pp. I-25-I-45).The following descriptive paragraphs and Table 15 (pp. 150-151) are based on that report.

Some 100 occupations, grouped into 48 occupation step clusters, and representing six major vocational education curriculum areas, are listed on Table 15. These occupations were deemed to be in persistent short supply in the Milwaukee SMSA in 1967. All of these occupations are expected to expand locally over the next eight years (to 1975), although by varying rates of increase. Also in Table 15, the national expansion rate is arrayed against each of these shortage occupational clusters. While the prospective rate of growth nationally may not coincide precisely with the anticipated local expansion rate, it is expected to be close enough to warrant long-range planning on this basis. (The Wisconsin State Employment Service will survey the job market on a periodic, and frequent, basis to assess the state of the job market and to report adjustments in the demand situation as they occur.)

The occupations listed carry with them a spectrum of detail of direct interest to vocational education authorities. These details include: (1) hard-to-fill openings (estimated number of current worker shortage) in the occupation; (2) intensity of shortages as reflected by the proportions of job openings in an occupation remaining unfilled for 30 days or more for which workers could not be found despite intensive search; and (3) the estimated rate of growth during a long-range national forecast period to 1975. A "rapid increase" denotes at least a 25 percent growth through 1975. A "moderate" increase ranges from 15 to 24 percent, and a "slow" rate of growth from 5 to 14 percent. These percentages refer to employment additions to the number of workers in an occupation in 1967. They do not include replacement requirements because of deaths, retirements, out-migration, or leaving the occupation, which in many cases can add substantially to the growth need.

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[6] U.S. Department of Labor, Bureau of Labor Statistics, "America's Industrial and Occupational Manpower Requirements, 1964-75," in Appendix I: The Outlook for Technological Change and Employment, to Technology and the American Economy, A Report by the National Commission on Technology, Automation, and Economic Progress (GPO, 1966).

## TABLE 15.--Occupations Having Continuing Shortages of Workers by Degree of Shortage Intensity and Anticipated Rate of Growth Milwaukee SMSA 1967

| Occupation | Number of Workers in Continuing Short Supply[1] | Degree of Intensity of Shortage[2] Percent | Forecast of Rate of Growth to 1975[3] |
|---|---|---|---|
| Distributive Education | | | |
| Attendant, Service Station | 60-100 | 60 | Rapid |
| Salesman and Sales Clerk | 100 plus | 70 | Moderate |
| Health Occupations | | | |
| Medical Laboratory Technician | 60-100 | 90 | Rapid |
| Nurse's Aide | 30-60 | 20 | Rapid |
| Nurse, Registered | 100 plus | 90 | Rapid |
| Home Economics Occupations | | | |
| Domestics and Housekeepers | 30-60 | 30 | Rapid |
| Office Occupations | | | |
| Bookkeepers and Related | 30-60 | 40 | Rapid |
| Mach. Oprs.,Billing, Bookkeeping | 60-100 | 50 | Rapid |
| Statistical Clerks and Related | Under 30 | 30 | Rapid |
| Filing Occupations | 30-60 | 40 | Rapid |
| General Office Clerks | 30-60 | 40 | Rapid |
| Correspondence Clerks | Under 30 | 50 | Rapid |
| Shipping Clerk & Rec.Clerk | Under 30 | 40 | Rapid |
| Secretaries | 30-60 | 50 | Rapid |
| Receptionist & Infor. Clerk | Under 30 | 40 | Rapid |
| Typist and Stenographers | 100 plus | 50 | Rapid |
| Technical Occupations | | | |
| Production Planner | 60-100 | 80 | Rapid |
| Electronic Technician | Under 30 | 80 | Rapid |
| Trade and Industry | | | |
| Automobile Mechanic | 60-100 | 60 | Moderate |
| Brick and Stone Mason | Substantial Demand | -- | Rapid |
| Carpenter | 30-60 | 50 | Slow |
| Chambermaid and Houseman | Under 30 | 50 | Rapid |
| Chauffeur and Truck Driver | 100 plus | 30 | Rapid |
| Cook | Under 30 | 40 | Rapid |
| Coremaker | 30-60 | 70 | Moderate |
| Construction Equipment Op. | Under 30 | 70 | Rapid |
| Draftsman | 100 plus | 90 | Rapid |
| Electrician | Under 30 | 90 | Moderate |
| Guard and Watchman | Under 30 | 60 | Rapid |
| Janitor and Sexton | 30-60 | 30 | Rapid |
| Lens Grinder and Polisher | Under 30 | 80 | Moderate |
| Machine Tool Operator | 100 plus | 70 | Slow |
| Machinist | 60-100 | 80 | Moderate |
| Maintenance Mechanic | 100 plus | 70 | Moderate |

TABLE 15 (continued)

| Occupation | Number of Workers in Continuing Short Supply[1] | Degree of Intensity of Shortage[2] Percent | Forecast of Rate of Growth to 1975[3] |
|---|---|---|---|
| Trade and Industry (continued) | | | |
| Assembler, Electrical Equip. | Under 30 | 90 | Rapid |
| Metal Fabricator | Under 30 | 90 | Rapid |
| Molder | Under 30 | 50 | Slow |
| Painter, Construction | Substantial Demand | -- | Rapid |
| Plastic Fabrication Occupations | Substantial Demand | -- | Rapid |
| Plumbers | Substantial Demand | -- | Rapid |
| Pressman, Printing | Substantial Demand | -- | Slow |
| Sewing-Machine Operator | 60-100 | 70 | Moderate |
| Sheet Metal Fabricator | Under 30 | 70 | Rapid |
| Tailor and Tailoress | Substantial Demand | -- | Moderate |
| Tool and Die Maker | 30-60 | 90 | Moderate |
| Upholsterer | Substantial Demand | -- | Rapid |
| Waiter and Waitress | 60-100 | 40 | Rapid |
| Welders | 100 plus | 70 | Moderate |

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[1] Continuing Short Supply.--The average number of job openings in various occupations in the Milwaukee area which have been unfilled for 30 days or more in two or more quarterly periods during 1967. Figures are based on job vacancy studies for the Milwaukee SMSA and unfilled openings data from the ES offices located within the SMSA.

[2] Intensity of Shortage.--Determined from ES District Office job order files, the "intensity" is shown as the percent of the openings on file that have been hard-to-fill (open 30 days or more for two or more quarters) for each of the occupations listed. This is a measure of difficulty in filling job openings. For example, if at least 50 percent of job openings in an occupation have been vacant for 30 days or more despite active search, the shortage would be described as of "high intensity." These percentages provide a reasonable indication of the degree of difficulty encountered in filling vacancies in these occupations throughout the Milwaukee area.

[3] Employment Forecast to 1975.--Prognosis given for each occupation or occupational cluster for the 8 years 1967 to 1975. This refers to growth rate, not replacements. A Rapid Increase implies a gain of 25 percent or more in employment nationally; a Moderate Increase is a 15 percent to 24 percent increase in employment; and Slow Increase, a 5 percent to 14 percent growth rate. (Prognosis based on BLS publications: Occupational Outlook Handbook, 1966-67, and America's Industrial and Occupational Manpower Requirements, 1964-75.)

It was not possible to calculate the exact need or the "intensity of shortage" for a few of the occupations because of insufficient data in either unfilled openings or job vacancy studies. However, communication with employers, unions, and trade associations indicated that a "substantial demand" did exist for these occupations. This is so noted in the table.

Some of the components in the line-item occupations listed in the table may seem to be at variance with one another. This is a reflection of the complexity of the labor market. For instance, the "slow" projected increase for carpenters may seen to be inconsistent with the "rapid" increases anticipated for other construction-related crafts (painter, plumber, etc.). However, it was found that information gained from interviews with local construction contractors was in substantial agreement with the Occupational Outlook Handbook in indicating that occupations within the construction industry will not necessarily continue the growth patterns of the past several years. The need for carpenters, in particular, will be affected by the expected increase in use of "pre-fab" construction materials which are prepared off site.

## FINDINGS OF TEST OF UFO-OOH APPROACH

The most significant occupational shortages numerically were among draftsmen; chauffeurs and truck drivers; salesmen and sales clerks; stenographers and typists; machine-tool operators; welders; maintenance repairmen; and registered nurses. Each of these had consistent shortages of at least 100 workers. Some occupations were in relatively shorter supply than others, which for training purposes could be the basis for establishment of a priority list. As a reflection of this "intensity of shortage" in Milwaukee, there were many occupations in which shortages represented a larger proportion of the total vacancies than others. Thus, there were some 17 occupational groups in which the proportion of hard-to-fill jobs was at least two-thirds of all such openings in the community for those occupations. These included salesmen and sales clerks; registered nurses; technical occupations; electricians; crane operators; draftsmen; lens grinders and polishers; coremakers; tool and die makers; machinists and machine tool operators; sewing machine operators; welders; maintenance repairmen; and workers in sheet metal fabrication and plastic fabrication.

The type of occupation for which these data are most easily interpreted is one like that of registered nurse, which has persistently large shortages of qualified workers (over 100), a high intensity of shortage (90 percent of all job openings in the area were vacant for at least a month), and a rapid rate of growth to 1975 (over 25 percent).

Nurse's aide demonstrates a different type of demand-supply situation. Demand for such workers in the community totaled over 200 but only about one-fifth (30-60) of the openings were hard to fill. While the small shortage is persistent, it is obviously not intense in relation to total area demand. Nevertheless the demand for workers in the occupation will expand rapidly and hence it is a "safe" candidate for training programs. (In its semi-annual or annual assessments of the labor market, the Wisconsin State Employment Service will watch this occupation carefully and make timely recommendations to the Milwaukee vocational education authorities.)

As a final illustration, service station attendant represents a common problem in the job market. The "shortage" of such attendants is attributed largely to a low-wage situation which causes high turnover in the occupation. In listing this and similar occupations as being in continuing short supply, it should be made clear that it is not the purpose of this listing to perpetuate a low wage structure in a given occupation nor, perhaps by its omission from the list, to correct a social situation. The findings simply describe an existing circumstance in the labor market. The Employment Service would be remiss if it did not call this situation to the attention of the training authorities.

This test of the Unfilled Openings-OOH technique, utilizing both local office data and a form of local expertise as represented by the gap study, took less than one month to complete. It was, as claimed, an inexpensive and relatively uncomplicated technique. However, as the study proceeded, PROJECT VISION became convinced that data generated by this technique must be supplemented by information on other important labor market determinants. The staff therefore prepared a manual describing the additional steps deemed necessary to supplement the data generated by the UFO-OOH technique (see App. I, pp. I-13-I-24).

It was the opinion of PROJECT VISION that when data on supply determinants are collected and analyzed by key occupations, vocational and other manpower training agencies are in a position to gauge their own potential contribution in eliminating shortages in, the labor market and in assisting individuals in acquiring necessary skills more effectively. In order to avoid a large over- or under-response to the actual needs of employers, a concise evaluation of the interaction between demand for labor (estimated universe of hard-to-fill openings) and the determinants of the labor supply for specific occupations is needed. Accordingly, the supplemental manual deals with (1) the identification of factors which determine supply, and (2) the uses to which such data could be put by Employment Services and manpower training agencies in determining training needs.

The critical question posed for evaluating the method is whether or not the estimated number of unfilled openings for each occupation is sufficient data for the purpose at hand -- that of vocational curriculum and enrollment planning. Is it advisable to recommend to vocational education authorities that they increase their classes in certain vocational areas because the unfilled openings data indicate there are shortages in those areas? Or, when it is found that demand exceeds supply in particular occupations, is it not also necessary to consider why the supply is limited in those occupations? Questions arise if the potential workers' point of view is assumed. Are the shortage occupations in a low-paying industry? How long is the training period? Is experience required? What about working conditions? Specific applicant characteristics? What about current enrollment, capacity, and cost of attending different training institutions? PROJECT VISION undertook to consider supply factors for individual occupations and to assess the interaction of supply with demand, believing that this should be the procedure before making recommendations to vocational schools. Examples of the application of this approach to the occupations of draftsman, auto mechanic, and registered nurse are found in "Occupational Employment Information for the Milwaukee Job Market Area" (App. I, pp. I-25-I-45). As prepared by PROJECT VISION, this represents a proposed format for occupational information reports.

## CONCLUSIONS AND RECOMMENDATIONS

The Unfilled Openings--OOH technique is relatively inexpensive, provides data regarding occupational shortage conditions, and requires far less time to complete than an Area Skill Survey. However, it was pointed out that the data provided are limited in that gap areas exist for those occupations for which the local Employment Service office has a low penetration rate. Moreover, even after the more significant gap areas are adequately filled through a gap study, the technique still lacks the basic criteria for developing projections. It uses local information to determine whether, at a given time, local area occupational growth appears to follow the national growth indicated in the Occupational Outlook Handbook. However, having no predictive device of its own, it must rest heavily on local labor market expertise. Although it does provide a system for identifying certain current occupational needs within an area, it is recommended that it be utilized only upon recognizing the fact that the data do not provide an absolute benchmark from which decisions pertaining to future plans can be made. Further, it is strongly recommended that the data be presented to vocational educators in conjunction with an analysis of supply determinants. This more comprehensive approach will facilitate a more effective use of the data generated by the original UFO-OOH technique.

# CHAPTER VIII

# OCCUPATION-BY-INDUSTRY MATRIX TECHNIQUE

## SUMMARY

PROJECT VISION made a serious attempt to apply the "Matrix Technique--Method A"[1] to the Milwaukee SMSA for the purpose of estimating changes in employment by occupation for the period 1960-1975. The results appear to be useful in some respects but are subject to certain limitations.

For many years now, the United States Bureau of Labor Statistics has been collecting data on the occupational employment patterns of various industries on a nationwide basis. Recently the Bureau devised methods of adapting these techniques to States and localities. Since it was thought that Method A might be applicable to the Milwaukee SMSA, a test of the method was undertaken with a view to determining its usefulness for developing occupational need projections for use in connection with vocational education curriculum design and programming. The procedures used in applying the method, the problems encountered, and an evaluation of the results in the light of their value to manpower planning officials are presented in some detail with the expectation that the information may be of interest to other States and labor market areas.

Although the method requires a number of steps in order to finalize occupational projections, the basic data and underlying statistical procedures are

1. Estimates of employment by industry for 1960 and 1975.
2. The application of the BLS matrix to these estimates.
3. Application of regression methods to the projection process.
4. Occupational patterns from the 1960 decennial Census.

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[1] U.S. Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, BLS Bulletin 1606 (GPO, Jan. 1969).

The basic data for this method has inherent characteristics which required that adjustments be made. These included adapting the various statistics (such as payroll data) to the BLS concept of one man-one job and making allowances for self-employed workers, unpaid family workers, and government employment. Another problem centered in the changing geographical coverage of the Milwaukee SMSA during the 1960's which required certain manipulations in the time series used to make them comparable.

Over and above the necessary adjustments to the data, which could be handled, there are several limitations in the method itself. One is that employment requirements for replacement needs resulting from deaths, retirements, migration and other causes were not accounted for in the method as used by PROJECT VISION.[2] They must be determined by other means. Another drawback, from the point of view of vocational education curriculum planning, was found in the fact that the labor requirements projections were not sufficiently refined occupationally. Improvement in the results of the method for this specific purpose will have to await more occupational detail in the industry staffing schedules on which the method relies. However, the overall projections of employment by industry to 1975 developed by PROJECT VISION for the Milwaukee SMSA were thought to be reasonable and valuable to manpower planning officials whose responsibilities do not require the specific occupational breakdown that educators need.

PROJECT VISION concluded, in answer to the basic question posed for the test of Method A, that the data did not yield sufficiently refined requirements for specific occupations or occupational skill levels to meet the needs of vocational curriculum planners in the Milwaukee SMSA. Moreover, because it does not attempt to evaluate the relationship between the educators training potentials and the overall area employment needs by occupation, PROJECT VISION raises the question of whether it produces estimates of "actual needs" that are as practical for curriculum design in local school situations as the admittedly imprecise estimating methods generally used for this purpose by school administrators. The value of the results of any projection technique in this regard is in direct relation to the degree to which it can lessen, in the future, the over-or-under response to expressed needs that has been the pattern.

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[2] Subsequent to the period during which PROJECT VISION carried out its research (1967-68), suggested alternative methods for projecting replacement needs have been devised by BLS and published in 1969 in the BLS guide, Tomorrow's Manpower Needs.

Recognizing that projection results obtained by use of regression analysis are considered to be "first approximations," PROJECT VISION, as an important aspect of the test, submitted the findings to representatives of manufacturing establishments, the construction industry, and selected trade, service, and financial institutions in order to obtain qualitative judgments which might be useful for evaluation purposes. The conclusions drawn from these consultations with experts who were in general knowledgeable about the SIC industrial classification was that, in spite of very real interest on their part, they were unable or hesitant to make judgments regarding long-term projections at the 2- and 3-digit SIC level. Generally speaking, PROJECT VISION obtained the most specific and helpful comments in those instances when the discussions pertained to the more detailed SIC occupational data.

One other central point of the test as conducted by PROJECT VISION concerned the applicability of the BLS Matrix method to other SMSA areas roughly the size and industrial composition of the Milwaukee SMSA. On this score, PROJECT VISION offers the firm recommendation that it should not be used in areas smaller than the very largest metropolitan areas such as Los Angeles or Chicago or in geographic areas smaller than a State or large economic region until the method is refined so as to yield more precise occupational detail and until a central or regional office is established for handling the necessary computations and data processing.

Because of the numerous calculations that must be undertaken in order to achieve the final results, the question arises as to the level of statistical experience needed by the research staff applying this method. It is PROJECT VISION's judgment that a highly trained mathematical statistician is not required. However, personnel working with Method A should understand the fundamentals of least-square methods and should have access to a trained statistician for consultation. They should also be acquainted with national (U.S. Census and Department of Labor) as well as important State and local statistics. If the latter skills are not at hand, members of the staff must be given adequate time to develop them.

## INTRODUCTION

As part of the PROJECT VISION research into methods of determining employment needs by occupation and ways of interpreting these data to local vocational educators and other manpower development personnel, the BLS occupational projection methodology known as the Occupation-by-Industry Matrix, Method A was tested for the Milwaukee SMSA.

This matrix technique was developed by the national office of the Bureau of Labor Statistics with the intent of assisting State and, possibly, local manpower planning agencies in determining the makeup of the future labor force. It was not initially developed, however, to address itself to a unique need of local vocational educators and other training personnel, namely, the design and development of curriculums relevant to the changing needs of the labor market, especially relating to entry-level positions. Thus, the matrix technique was designed to determine future employment by occupation and not necessarily to identify the needed occupational skill levels with which vocational training programs are more realistically involved.

PROJECT VISION's evaluation of the use of the BLS Matrix technique is concerned, therefore, with whether the method -- when applied to an area such as the Milwaukee SMSA -- will afford occupational data that will be reliable and meaningful enough to provide a basis for intelligent vocational education curriculum planning and design. In other words, does the method apply well to areas which are smaller than a state, a large economic region within a state, or such large metropolitan areas as New York, Chicago, and Los Angeles, as a means of determining future training needs which could be met in part by a local vocational education system.

In the State of Wisconsin, at the time of PROJECT VISION's field work, vocational school curriculums were developed primarily at the local or school district level. When such planning is done at the local level, then it is essentially, though not entirely, local level projections of occupational needs that should be used by curriculum designers and others to determine the future size and mix of curriculums within a school district. Statewide projections of occupational requirements, while valuable in some aspects of manpower planning, may not be particularly helpful to local vocational educators in avoiding over- or under-training responses to occupational needs in their localities except for those programs in which people are being trained to meet national or state-wide needs. In States where State boards of vocational, technical, and adult education have greater control over funding, development and design of curriculums, than was true in Wisconsin, more justification may be found for using the Occupation-by-Industry Matrix technique on a state-wide basis.

## SCOPE AND METHODOLOGY

The presentation that follows is both a description of the methodology, with the steps required to adapt it to an SMSA the size and industrial makeup of Milwaukee, and a feasibility analysis of its use for such an SMSA in terms of its cost, potential practical application by local vocational educators, and the reliability of the projections obtained.

The occupational projections derived through the use of the Occupation-by-Industry Matrix involved the use of three primary and critical inputs:

1. Estimates of local employment by individual industries for the base year of 1960 and the projected local employment by industry for the target year of 1975.
2. The occupational staffing patterns or structure for each industry for the years 1960 and 1975.
3. Employment by occupation data for 1960 for the given locale.

Method A does not require that a locality determine the occupational staffing patterns of individual industries for its own area. National industrial staffing patterns are used. However, the method does require area personnel to determine the total employment by industry covering a maximum of a 116-industry breakout for the base year of 1960 and the target year of 1975. The area research personnel are also required to estimate the number of people employed by occupation for a maximum of 191 occupations covering total employment in the area for the base year of 1960. In present practice (1968), this estimate of employment by occupation is based on the 1960 decennial Census, with adjustments made for "Other" designations. (App. F3, p. F10) contains a discussion of adjustments made to include "Other" designations and to convert Census occupational data to the "all employment" concept used by BLS.)

The estimates of occupational needs in 1975 and the forecast of changes in the number of employed workers by occupation from 1960 to 1975 which are derived from this method refer to the expansion or contraction of labor demand. In order to estimate the total labor requirements for the years under consideration it is also necessary to estimate occupational needs due to labor replacement requirements arising from retirement, death, migration, entry into the Armed Forces and other causes. PROJECT VISION did not take these requirements into account.

The occupational projections presented for the Milwaukee SMSA cover those private nonagricultural wage and salary, self-employed, unpaid family, and government workers based on a one-man, one-job concept who will likely be employed in specific occupations in 1975. These estimates are based in part on an assumption that the relationships of employment by industry to most factors affecting employment which existed between 1958 and 1967 will tend to continue for several years into the future.

It should be emphasized that the use of the BLS Matrix, Method A to estimate local area occupational needs in the future is not premised on the assumption that local staffing patterns by industry are necessarily the same as they are for the Nation or for another locale. (See App. F4 for comments on some differences between staffing patterns in Milwaukee and elsewhere.) But in using this method it is assumed that the rate of change from 1960 to 1975 in the staffing patterns of a particular industry will be essentially the same for the locale as for the Nation. This may not always be the case.

Thus, by multiplying national occupational staffing patterns for each industry by the employment figures for the appropriate local industries in the base year of 1960 and by the estimates of local employment by industry for 1975, use is made of the national rate of change in occupational patterns for individual industries. At the same time, the relative growth rate of local employment by local industry is used to determine the expansion of occupational needs on the local level. Consequently, the reliability and appropriateness of the methodology used by, and most likely available to, local personnel to project local employment by industry to 1975 is of paramount concern to the analyst in evaluating the feasibility of using the matrix to determine future occupational needs.

## Step-by-Step Procedures Used in Method A

The major steps to be followed in executing Method A of the BLS Matrix approach are given below. It should be noted, in summary, that in this method the 1975 projections are ultimately based on figures for local employment by occupation in 1960 as developed from the decennial Census (Step 5). The other estimates to be made (Steps 1-3) are used solely for the purpose of establishing rate of change in occupational employment in the labor market area from 1960 to 1975.

1. Make estimates of all employees by industry for a locale for the base year of 1960 and the projected year of 1975, comparable to the all-employment concept used by BLS.

2. Factor the local employment by industry data for each industry (from Step 1) by the nationally estimated occupational patterns for each industry, for 1960 and 1975.

3. Sum the estimated occupational employment by industry for all industries in the area (from Step 2) to obtain total area employment by occupation, for 1960 and 1975.

4. Derive a ratio of 1975 estimated employment by occupation to 1960 estimated employment by occupation for all occupations covered (using estimates from Step 3). This establishes the rate of change for each occupation in the specific locale over the period 1960-1975.

5. Establish independent estimates of occupational employment in the area for the base year of 1960, derived, with modifications, from the 1960 decennial Census. (See App. F3, p. F10, for the manner in which adjustments were made to the occupational data secured from Table 121 of the 1960 decennial Census for the Milwaukee SMSA.)

6. Factor the rate of change, or ratio of 1975/1960 employment by occupation (from Step 4), against the independent estimates of occupational employment in the area (from Step 5) to obtain the projections of local employment by occupation for 1975.

## Estimates of Local Employment by Individual Industry Breakout for 1960 and 1975

The estimates of employment by industry for 1960 and 1975 refer to total nonagricultural employment based on the BLS concept of total employment. The employment by industries are totals of estimates of private wage and salary data (Current Employment Statistics), estimates of self-employed, unpaid family workers, and government employees other than public administration employees by industry. Domestics were not included. Adjustments were then made to eliminate dual job holders in order to arrive at a one-man, one-job concept within industries. Then were added estimates of individuals classified as employed but not on a payroll (unpaid absences).

The private wage and salary employment figures (Current Employment Statistics) were based in large part on unpublished detail secured from the Bureau of Reports and Analysis, Unemployment Compensation Division, Wisconsin State Department of Industry, Labor and Human Relations. This detail was broader than that found in the published Employment and Earnings Statistics for States and Areas for the Milwaukee SMSA.

## Adjustment for Change in Definition of Milwaukee SMSA[3]

In order to project private wage and salary data by industry to the target year 1975, a time series of private wage and salary data by industry breakouts was established. The series was set up for the years 1958 through 1967, resulting in data for a 10-year period. Within this 10-year span, however, the Milwaukee SMSA changed from a 2-county area to a 4-county area. Accordingly, the data for the Milwaukee SMSA covered private wage and salary employment for Milwaukee and Waukesha Counties up through 1962. Beginning with January 1963, Ozaukee County was brought into the Milwaukee SMSA. (In 1960, Milwaukee and Waukesha had a combined population of 1,194,290, while Ozaukee had a population of 38,441.) In January 1967, Washington County, with a population of roughly 56,000, was included. Therefore, to make each year's employment by industry logically related to the employment for each other year, adjustments were made to include Ozaukee wage and salary employment for each appropriate industry with the data for Milwaukee and Waukesha Counties for the years 1958 through 1962. The same adjustment was then made to include Washington County with the other three counties for the years 1958 through 1966. (See App. F1, pp. F2-F4, for procedures used in making these adjustments.)

As indicated, the adjustments were necessary to secure wage and salary data that were consistent in terms of the Milwaukee SMSA area for each year of the 10-year time series and for the projected year 1975. The wage and salary employment by industry for 1960 in this 10-year time series therefore refers to employment within the 4-county area and not the 2-county SMSA as it was constituted in 1960. However, the 1960 estimate of total employment by industry in the Milwaukee area that was used to determine the rate of change in occupational employment from 1960 to 1975 (Steps 1 through 4, p. 161) covered employment in the 2-county Milwaukee SMSA only, as constituted in 1960.

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[3] For a complete discussion of the geographical composition of the Milwaukee SMSA, see Chapter III, pp. 27.

## APPLYING THE BLS MATRIX

In using the BLS Occupation-by-Industry Matrix, Method A to estimate 1975 employment by occupation for the SMSA or for a State, 1960 estimates of occupational employment secured from the decennial Census were used. Employment by occupation for the Milwaukee SMSA found in the decennial Census in 1960 refers to the two counties of Milwaukee and Waukesha alone. For 1975, estimates of employment by occupation for the 4-county SMSA are secured by multiplying estimates of employment by occupation for the 2-county area in 1960 by a change factor for 1960 to 1975 by occupation that reflects the change taking place in employment for an SMSA constituting two counties in 1960 and an expanded SMSA constituting four counties in 1975. The rate of change in employment by occupation (the ratio of 1975 employment by occupation to 1960 employment by occupation for the Milwaukee SMSA) therefore reflects -- in addition to changes in employment by industry and changes in staffing patterns of individual industries -- changes in the geographic definition of the Milwaukee SMSA from 1960 to 1975.

Consideration was given to adjusting the 1960 occupational data secured from the decennial Census from a 2-county coverage to a 4-county coverage. It would then have been possible to multiply these estimates of occupational employment in the 4-county area in 1960 by a change factor or ratio of 1975 employment by occupation for the 4-county area to an adjusted employment by occupation estimate covering the four counties in 1960. It would have been desirable to develop a change factor in employment by occupation for comparable areas. Unfortunately, detailed occupational 1960 decennial Census employment data for Washington and Ozaukee Counties do not exist. There is no reason to believe that occupational employment data by an individual decennial Census occupational classification for Washington and Ozaukee Counties possess the same relationship to or proportion to total employment as they do in Milwaukee and Waukesha Counties. Consequently, adjusting 1960 decennial Census employment data by occupation for the 2-county Milwaukee SMSA to the four counties by adding employment estimates by occupation for Washington and Ozaukee Counties to those for Milwaukee and Waukesha Counties in 1960 would have been misleading.

## Time Series for Projecting Wage and Salary Employment to 1975

Initially, a time series was established for an 88-industry breakout covering total nonagricultural wage and salary employment excluding domestics (household services) for a 10-year period from 1958 through 1967. To arrive at the 88-industry breakout, covered employment tables by county, secured from the Unemployment Compensation Division of the Wisconsin Department of Industry, Labor and Human Relations, were used to derive ratios of 3-digit industries to 2-digit industries, ratios of 4-digit industries to 3-digit industries, and of 4- to 2-digit industries. These ratios were then factored against private wage and salary data from *Current Employment Statistics* for March of each year from 1958 through 1967 to derive an employment by industry breakout in greater detail than is provided by the *Current Employment Statistics* industry detail. Annual average employment by appropriate industry was secured by making a limiting assumption that the ratio of annual average employment to March employment for a 2-digit or 3-digit breakout (such as SIC 33) would be approximately the same as for a 3-digit or 4-digit breakout (SIC 335 or 3351). Thus, for any given year in the time series, the ratio of annual average employment to March employment (for SIC 33) multiplied by March employment for the 3-digit breakout (SIC 335) would give us the annual average of the 3-digit industry to be included in the individual industry time series.

## Use of Limited Time Base for Projection -- Regression Problems

The time series for the Milwaukee SMSA wage and salary employment, upon which the 1975 projections of wage and salary employment by appropriate industries were based, was limited to ten years (1958 through 1967). The following paragraphs point out that the reasons for this limitation were primarily concerned with (1) changes in the SIC Manual, and (2) various considerations associated with regression analysis techniques used.

The Standard Industrial Classification was changed in 1957. Conversion from the pre-1957 classification of industry breakout to the post-1957 code was made for manufacturing industries by 2-digit and 3-digit categories back to 1947 in the local *Current Employment Statistics*. However, this was not done for the 2-digit breakout of nonmanufacturing industries. Instead, nonmanufacturing wage and salary employment by divisions of industries (but *not* individual industry breakout) was converted to the new SIC code from 1957 back to 1939.

The method used to project the time series of wage and salary employment by appropriate industry breakout to 1975 is essentially based on a number of models or variations of a least-square regression analysis technique. (See App. F2 for a discussion of the feasibility in terms of effort, accuracy, skills available and problems involved in using a least-square regression technique to project wage and salary employment by industry data to the target year 1975. Included is a brief digression concerning the limits imposed by this method on the projections.)

In order to regress the time series on one another, it would be necessary to work with a time series of wage and salary employment by industry in which employment for any one year was logically related to every other year. In other words, data for each year must relate to the same universe. This factor, combined with the SIC code problem, limited the number of observations or years that could legitimately be used in the time series for nonmanufacturing industries

The use of regression analysis to help determine the future employment by industry involves considerations in addition to that of the number of observations used. For example, the universe from which these observations (wage and salary employment by industry) are drawn must remain relatively stable over the period of time involved in the time series. Also, the universe for a number of years to come must be sufficiently like that of the previous period if the regression relationship based on the past is to continue to apply. Certainly, if too many firms shift out of one SIC classification to another because of a shift in products sold or volume of business done in one product versus another, these criteria would not be met.

## Use of Limited Time Base for Projection -- Cyclical and Seasonal Factors

Consideration was also given as to whether the trends and seasonal factors affecting most manufacturing industries, both durable and nondurable, remain sufficiently stable; that is, are trends in these industries for the decade of the 1940's logically related to those of the 1950's and the 1960's, etc.? The trends of employment by industry in the time series used included cyclical effects; these effects were not eliminated. Therefore, the trend lines for a number of manufacturing industries, especially durable manufacturing industries, in the Milwaukee SMSA in the 1960's are unlike those of the 1950's. There were recessions about every three years from 1950 to 1961, and none from 1962 on. This explains in part the change in the trends of employment by industry for time series extending back beyond 1958. Consequently, this factor limited the number of years selected for the time series for manufacturing industries.

## Problems of Other Techniques for Projection of Employment

In using the BLS Occupation-by-Industry Matrix, the relative growth rate of local employment by industry is found to play a critical role in determining the expansion or estimate of future occupational needs. Any analyst, in evaluating the feasibility of using the BLS Matrix for his locale, must be essentially concerned with the reliability of the methods he has at hand with which to project future employment by industrial detail, even though the projections offered by these methods are thought of as first approximations only. It is seldom that suitable data exist to permit the analyst to use a relatively sophisticated methodology in which he could relate employment by industry to the multiple factors affecting employment. In most cases he will be forced to use a proxy such as time or national employment by industry to represent the movement or trends in all the factors affecting changes in employment by industry for his locale.

A number of exhaustive studies have been made over the years defining various sophisticated approaches to projecting employment by industry into the future. Various attempts have been made to relate estimates of total economic activity to individual industry output and then to relate this to individual industry employment for an SMSA. These are discussed in the Denver study, Methodology for Projection of Occupational Trends in the Denver Standard Metropolitan Statistical Area (MDTA Contract No. 4264).[4] It is questionable whether this method would develop employment projections by detailed industry breakout any more reliable than would be secured by the use of less involved or simpler regression analysis models.

Another sophisticated method for determining future employment by detailed industry breakout is discussed in detail in the Temple University report.[5] This report proposes that future industry sales for major industries within a given locale are determined by considering the relationship that the local industries' sales have to the national market. In this way an effort is made to determine whether the national trends for a particular industry in sales and employment could be used to determine first, the likely sales of that industry on a local level, and second, the likely employment of that industry.

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[4] Leslie Fishman and others, Methodology for Projection of Occupational Trends in the Denver Standard Metropolitan Statistical Area (MDTA Contract No. 4264) (Boulder, Colo.: University of Colorado, 1966).

[5] Louis T. Havrus and others, Projective Models of Employment by Industry and by Occupation for Small Areas: A Case Study (Philadelphia, Pa.: Temple University, 1966).

A description of these and like methodologies, and an analysis and evaluation of their appropriateness in terms of skills required, costs involved, and the like, have been discussed in detail in a number of reviews of the above publications as well as in the publications themselves.

The fact is that few State agencies are equipped to work with either refined econometric models leading to employment projections by industry or with local input-output models to determine local output which in turn would be translated into employment-by-industry data. It is also to be questioned whether the degree of accuracy desired for employment-by-industry figures would be secured in this manner.

Therefore, very practical and critical consideration must be given to which methods are most likely available to area personnel with which to project employment-by-industry estimates and to the limitations on the reliability of the projections imposed by such methods.

The methods most likely to be used for projecting employment requirements (the first approximations) rely on a regression analysis. The regression analysis of trends will in fact be simple and not multi. Although PROJECT VISION was interested in analyzing trends in a number of factors determining employment change by industry, actual use was made of regression analysis in which one independent variable acts as a proxy for all "real" factors affecting employment by industry.

It was decided to use the method of least squares in fitting 15 different trend lines for the wage and salary employment projection of 88 individual or combinations of individual industries.

## Application and Testing of Regression Method

The 15 regression lines were based on three primary relationships between wage and salary employment by industry (the dependent variable) and the one independent variable used as a proxy to represent all real factors determining employment by industry.

The first relationship tested was one in which local employment by industry, the dependent variable, was regressed against time, the independent variable. Time, the independent variable plotted along the horizontal axis, in fact refers to past employment within this industry for each and every year included in the time series (1958 through 1967). A simple correlation coefficient was established to determine whether or not a good fit or whether or not a discernable trend existed. If the correlation coefficient is significantly high, any variation of actual or observed employment within that industry for each year from the trend line drawn is said to be caused by random error. If this is the case, then it is possible to use this regression equation to project or compute 1975 employment. (See App. F2, pp. F5-F9, for limitations and pitfalls of using regression analysis or least squares for this purpose.) There is little reason, however, to believe that a linear relationship in fact existed for a large number of industries. Therefore, an attempt was made to investigate possible nonlinear relationships as well as a linear relationship over time (10-year time span) in a linear fashion. Five variations or models of the first relationship (local employment by industry regressed against time) were then run. (See App. F7, pp. F21-F25, on data processing program used for this purpose.)

For the first relationship

1. Local employment by industry was regressed against time, the independent variable.

2. Local employment by industry was regressed against the natural log of time.

3. The log of local employment by industry was regressed against time.

4. The log of local employment was regressed against the the log of time.

5. Local employment by industry was regressed against the square root of time.

The second relationship tested was based on the assumption that local employment by industry continues to be a fixed or constant percentage of national employment. In this case, local wage and salary employment by appropriate individual industry was regressed against national wage and salary employment data for the same industry.

Five regression lines were run for the second relationship. For each appropriate industry:

1. Local wage and salary employment data were regressed against national wage and salary employment for that industry.

2. Local wage and salary employment was regressed against the natural log of the national wage and salary employment for that industry.

3. The log of local employment was regressed against the national employment for that industry.

4. The log of local employment was regressed against the log of national employment for that industry.

5. Local employment was regressed against the square root of national employment for that industry.

In the third relationship tested, the ratio of local employment to national employment for appropriate industries was regressed against time. For projection purposes, the projected ratio to 1975 was multiplied by national employment in that industry for 1975. The basic assumption in this case was that the relationship between local and national employment for particular industries has been changing over time, but in a "predictable fashion."

Five regression lines were run for this model as well:

1. The ratio of local wage and salary employment data to national wage and salary employment data by industry was regressed against time.

2. The ratio of local wage and salary employment to national wage and salary employment was regressed against the natural log of time.

3. The log of the ratio of local employment to national employment was regressed against time.

4. The log of the ratio of local employment to national employment was regressed against the log of time.

5. The ratio of local employment to national employment by industry was regressed against the square root of time.

It is acknowledged that all possible relationships of the dependent variable (local individual industry wage and salary employment) and all explanatory factors represented by the independent variable (time, or national employment) have not been exhausted by the use of the 15 models referred to above. It was believed that these models or variations of the three basic relationships described above would offer a fairly good opportunity of discovering a good fit for past local employment by individual industry to the independent variable acting as a proxy or representative of relevant factors affecting employment. This is not to say that a goodness of fit for any particular least-square regression model or technique necessarily assures good prediction of employment, especially as the projection period increases from one to possibly three years to a period of four, five, six or more years.

Much has been written on the inapplicability of least-square regression methods for analyzing time series in which successive observations (employment by industry for each year) are serially correlated. Unless the "error terms" in the regression model are independent of each other (see App. F2, p. F7), spurious conclusions as to which basic relationship best explains past performance of employment by industry will be made.

If serial or auto correlation exists, "the error is not distributed independently of the relevant independent variable," and successive errors from one year to the next are not "distributed independently of each other." This means that the estimates of the regression coefficients need not in fact have "least variance." An underestimate of the actual variance may then be brought about since the usual formula used to estimate the variance of the projection is inapplicable, and the confidence intervals based on T and F distributions are invalid.

Therefore a Durbin-Watson Statistic was run for each of the 15 models for each industry to determine whether auto correlation was present. Approximately one-half of all the regression models or techniques run for all the industries were eliminated from consideration for purposes of projecting future employment by industry because of the existence of serial correlation.

As stated earlier, 15 regressions were run for 88 industry designations. A 61-industry breakout covering all nonagricultural employment, and excluding domestics, was settled upon. Some 2-digit industry projections plotted into the final computer program were aggregates of 3-digit, and in a few cases, 4-digit industries that were individually projected. Estimates of wage and salary employment for 1975 for five of the 61 industries plotted into the program could not be secured from the regression models used. These projections were based on the not always satisfactory approach of consulting with industry and union experts most aware of the trends for their industry, usually at best for a 4-digit or 3-digit industry classification.

Very few of the projections were based on regression models possessing a correlation coefficient lower than .86. Many of the regression models had correlation coefficients of .92 or more. Consideration was given to the regression coefficient, the standard error of estimate, to plus/minus values as well as the correlation coefficient before decisions were made as to which, if any, regression model could be used to project employment for a particular industry to 1975.

### Checking 1975 Projections of Employment With Projections of Labor Force

To determine the reasonableness of the aggregate industry-wide employment projections for 1975 (total number of jobs) that were based essentially on regression analysis of individual industries, an independent estimate of the labor force for 1975 covering the four counties making up the Milwaukee SMSA was made and compared with PROJECT VISION's projections. The labor participation rates for five age and sex breakouts for the State of Wisconsin secured from a study made by the National Planning Association were used.[6] These participation rates by age and sex breakout were factored against adjusted population projections by counties made by the Department of Rural Sociology, University of Wisconsin, July 1968.[7] Population projections for the counties by age and sex breakout exist for 1970 and 1980. Linear interpolation for 1975 for each of the four counties and each of the five age classifications was made.

The total estimated labor force for 1975 resulting from this method for the four counties of the SMSA is 707,464. Assuming an overall unemployment rate of 3 percent in that year, a figure covering total employment in 1975 of 686,200 was derived. This compares to an aggregate employment projection based on the regression analysis and adjusted by qualitative judgment of a few selected industry experts (total employment concept of nonagricultural employment excluding domestics) of 660,100. These two figures are not entirely consistent or logically related. The projections of industry-wide employment based on regression analysis and adjusted for all other employees, excluding dual job holders and including those listed as employed but not on payrolls, was not adjusted to exclude those who work in the Milwaukee SMSA but live elsewhere. Nevertheless, if a rough estimate of the relatively few expected to be employed in agriculture and forestry in these suburban counties along with an approximate estimate of the number of domestics to be employed in the Milwaukee SMSA in 1975 were added to the aggregate employment estimate by industry of 660,100 for 1975, very little difference would remain between PROJECT VISION's estimate and the 686,200 figure (or the 707,464 labor force figure adjusted for an unemployment rate of 3 percent).

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[6] National Planning Association, State Projections to 1975: A Quantitative Analysis of Economic and Demographic Changes, Regional Economic Projection Series Report No. 65-II (Washington, D.C., Oct. 1965); Table 10-5, p. 172.

[7] These projections are based on the Ratio Projection method developed by Horace Handlon and Joseph Perry. The procedure used to adjust for these more recent migration rates for counties within Wisconsin is similar to that used by the U.S. Census Bureau's Component Method II (Series P-25, No. 339, "Methods of Population Estimating, Illustrative Procedure," June 1966).

It should be pointed out that the available labor participation rates used to estimate the labor force for the four counties making up the Milwaukee SMSA were state-wide and not county-wide rates.

All that can be said at this point is that the total projections of employment by industry do not seem to be unreasonable, based on the above comparison. This does not, of itself, give the assurance that all of the individual industry employment projections based in part on regression analysis are as reliable or satisfactory as would be desirable.

## ESTIMATES OF ALL OTHER EMPLOYEES

Estimates of all other employees (self-employed, unpaid family workers, and government employees) by function or industry were derived by a number of methods based on different sources of data. The methods are described below for self-employed and unpaid family workers and then, under a separate heading, for government employees other than public administration personnel.

### Alternative Methods of Estimating Self-Employed and Unpaid Family Workers

The ratio of self-employed workers to wage and salary employees and the ratio of unpaid family workers to wage and salary employees by appropriate industry detail secured from Table 129 of the 1960 decennial Census for the Milwaukee SMSA were often unsatisfactory in the breakout of industry detail. The industry detail found in Table 129 is not satisfactory if it is desired to project employment by industry for a large number of 3- and in some cases 4-digit industries. This is especially true for the retail and wholesale trade industries.

## Estimate for Self-Employed in Wholesale and Retail Trade Industries

For those durable and nondurable manufacturing industries in which self-employed and unpaid family workers make up a relatively small percentage of total employment, a simple proration of self-employed and unpaid family workers from a 2-digit industry detail secured from the decennial Census to the component 3-digit industries may not significantly affect the reliability of the estimate of total employment within these industries. However, this does not hold true for a number of trade and service industries in which family and self-employed personnel make up a relatively larger percent of total employment. For wholesale and retail trade industries in which greater industry detail is required than is available in the decennial Census, ratios of self-employed and unpaid family workers to wage and salary workers for 3- and 4-digit industries from other sources must be used.

In such instances, ratios of self-employed and unpaid family workers to wage and salary employees for a number of wholesale and retail trade industries of 3- and 2-digit industry detail were established on the basis of the Census of Business Reports for 1958. For those wholesale and retail trade industries in which 1958 ratios of self-employed and unpaid family workers to wage and salary workers differed significantly from the ratios secured from the 1960 decennial Census, the former ratios were used.

The ratios secured from Table 129 of the 1960 decennial Census and a number of ratios secured from the Census of Business Reports were then multiplied by the April 1960 wage and salary employment data for appropriate industries secured from the Current Employment Statistics. An adjustment was then calculated for annual averages of employment by multiplying this estimate of self-employed and unpaid family workers for April 1960 by the ratio of the annual average employment of wage and salary employment (1960 Current Employment Statistics) to the wage and salary employment (Current Employment Statistics) for April 1960. In this manner first approximate estimates of annual average employment of self-employed and unpaid family workers by individual industry for the base year of 1960 were secured.

## Estimates for All Other Employees

Another means tried for establishing estimates of self-employed and unpaid family workers was to use the BLS-WSES estimate of all other employees (self-employed, unpaid family workers and domestics) and subtract an estimate of the number of domestic workers from this total. This estimate was made for "total all other employees" for the State and selected counties on a monthly basis by the WSES, using a standard methodology prescribed by the United States Training and Employment Service for State Employment Security Agencies engaged in making these estimates for reporting requirements. Employment by industry detail for this category of employees was not made.

The first step involved establishment of ratios of self-employed and unpaid family workers for all industries. These ratios were secured from Table 129 of the 1960 decennial Census. A ratio of self-employed and unpaid family workers for an individual industry, for example SIC 25, Furniture and Fixtures, to all self-employed and unpaid family workers (in the State or SMSA) was established from Table 129. Based on a limiting assumption of constant proportions (the percentage of all self-employed and unpaid family workers found in any one industry was assumed to remain constant over a number of years), the above ratio for 1960 for any one industry was multiplied by the total BLS-WSES estimate of nonfarm self-employed and unpaid family workers for a number of years beginning with 1958 (the beginning of the time series).

It had been hoped that an establishment of a time series of nonfarm self-employed workers would reveal a discernable trend line for a number of industries which could then be used to project this "other" employment to the target year 1975. In most instances, however, a discernable trend line was not found to exist.

## Estimate Using a Constant Ratio

Another method experimented with was to take the ratios of nonfarm self-employed and unpaid family workers by individual industry to wage and salary employment for each industry secured from the decennial Census for 1960 and to assume that this ratio would remain relatively constant up through 1975. By multiplying these ratios by projected wage and salary employment by industry for 1975, estimates of self-employed and unpaid family workers for 1975 would be secured. However, it is questionable whether this assumption of constant proportions makes much sense for any industry category.

In using this method a larger number of total nonfarm self-employed and unpaid family workers in 1975 would necessarily be estimated than were employed in the base year of 1960, since total projected wage and salary employment for 1975 in the aggregate is considerably larger than 1960 wage and salary employment. Since percentages of self-employed and unpaid family workers are relatively larger in the faster growing trade, finance and service industries than in manufacturing industries, an estimate of self-employed and unpaid family workers for 1975 would be overstated by using a 1960 ratio of other employees to wage and salary workers.

## Estimate Using An Annual Average

Still another method used to estimate self-employed and unpaid family workers for 1975 by industry was to average the total employment of self-employed and unpaid family workers for the Milwaukee SMSA based on the BLS-WSES estimates of "other" employees for a number of years and to assume that this average would prevail in the target year of 1975. An annual average was based on a 10-year time series from 1958 through 1967. A longer time series of 18 to 20 years was not used for the SMSA partly because of the number of adjustments that would have been required. An average based on an 18-year period resulted in an estimate of total employment of self-employed and unpaid family workers for the Milwaukee SMSA approximately 2 percent smaller than the 1960 estimate. The average based on the 10-year period, 1958 through 1967, afforded an estimate that was 1.5 percent larger than the 1960 estimate.

Unfortunately, this method does involve a number of complications when prepared for an SMSA that do not exist for the preparation of a State forecast. The selected counties for which BLS estimates "other employees" are essentially counties that are grouped into an SMSA. The Milwaukee SMSA changed from a 2-county area in 1960 to a 4-county area in 1967. Adjustments had to be made for the years 1958 through January 1963 for Ozaukee County and for 1958 through January 1967 for Washington County. This method again forced an assumption of constant proportions to be made. It was assumed that the ratio of all wage and salary employees for the four counties to the two counties would hold for the self-employed and unpaid family workers as well. Multiplying this ratio by estimates of self-employed and unpaid family workers for the two counties for 1958 through January 1967 an adjusted estimate of these "other employees" covering a 4-county area was derived.

The average total employment for self-employed and unpaid family workers based on a 10-year period is higher than the average based on a longer time span since self-employed and unpaid family workers are declining, at least in relation to the changes taking place in wage and salary employment. Therefore, the total estimates used for self-employed and unpaid family workers for 1975 are slightly higher than if the average employment had been based on an 18-year or 20-year period. It is, nonetheless, considerably less than an estimate based on the use of 1960 ratios of self-employed and unpaid family workers to wage and salary workers.

To derive estimates of self-employed and unpaid family workers for 1975 by industry detail, it was necessary to multiply the total estimated number of these employees by the ratios of self-employed and unpaid family workers for any one industry to the total of self-employed and unpaid family workers secured from Table 129 of the 1960 decennial Census. Estimates of self-employed and unpaid family workers in greater detail for retail trade, wholesale trade, and service industries than Table 129 affords would be secured by multiplying the ratios of self-employed and unpaid family workers of a particular 3-digit industry to its 2-digit classification (Census of Business, 1958) by the ratio of the 2-digit industry self-employed and unpaid family workers to the area-wide or total self-employed and unpaid family workers (total for all industries) secured from Table 129 of the decennial Census.

## Estimates of Government Employment (Other than Public Administration Personnel)

Estimates for government employment other than public administration personnel by industry were needed in order to have figures on an industry basis insofar as possible. Essentially they were secured by using the ratios of government employment by industry to private wage and salary employment in Table 129 of the 1960 decennial Census for the Milwaukee SMSA. The 1960 ratios were factored against the 1960 Current Employment Statistics wage and salary employment figures by appropriate industry to secure estimates of government employment other than public administration personnel by industry. These government employment estimates by individual industry were totaled and then subtracted from Current Employment Statistics estimates of total government employment in the Milwaukee SMSA in 1960. It included estimates of Federal, State, and local government employment other than local school and State school employees. In this manner an estimate of total public administration personnel employment within the Milwaukee SMSA in 1960 was secured. Local and State school employment in the Milwaukee SMSA in 1960 was added to private wage and salary employment figures for educational services industries SIC 82 and SIC 84.

A very limiting assumption was used to make the first estimates of government employment other than public administration personnel by industry for 1975. To begin with, it was assumed that the 1960 ratios of government employment other than public administration personnel and those employed within local and State educational institutions to wage and salary employees secured from Table 129 of the 1960 decennial Census would be relatively the same in 1975. However, contact was made with the Wisconsin Electric Power Company offices in Milwaukee, the Hospital Council of Greater Milwaukee, and with Occupational Analysis Field Center personnel familiar with the transportation service industry (SIC 47) to determine whether the 1960 ratios would be at all realistic for 1975 for those industries that employ most government employees other than public administration personnel, post office employees, and educational personnel. These industries included transportation services (SIC 47), public utilities (SIC 49), and hospitals (SIC 806). The ratios were changed according to the advice received.

The adjusted ratios were multiplied by 1975 estimates of wage and salary employment by industry to derive estimates of government employment other than public administration personnel by industry. These estimates were totaled for all industries, and then subtracted from a projection for 1975 of total noneducational service government employment (Federal, State, and local) in the Milwaukee SMSA. Projected employment of local and State school personnel for 1975 was included in SIC 82.

The projection of total noneducational service government employment was based in part on a time series established from the Current Employment Statistics separately for State nonschool, local nonschool, defense, post office, and other Federal estimates of employment for the years 1958 through 1967, and in part on consultations with the Bureau of Personnel, Wisconsin State Department of Administration. The time series for the years 1958 through 1967 refers to adjusted SMSA employment which covers employment in the 4-county area. It was determined that local and State governmental noneducational services would increase in the adjusted 4-county SMSA in 1960 to 1975 by a little less than 40 percent. This estimated rate of increase is somewhat lower than anticipated rates of increase in this kind of local and State government employment throughout the country. Therefore, PROJECT VISION's estimate of total local and State noneducational service government employment is most likely an underestimate of 1975 employment. A rate of increase in Federal government employment other than postal employees in the Milwaukee SMSA from 1960 to 1975 is estimated to be 17 percent.

Estimates of government employment other than public administration by industry for the 2-county Milwaukee SMSA (as constituted in 1960) were added to estimates of wage and salary employment and estimates of self-employed and unpaid family workers by industry for the 2-county area in 1960. Estimates of government employment, other than public administration personnel, for the SMSA of four counties (as constituted at present) were added to projections of wage and salary employment and estimates of self-employed and unpaid family workers by industry for the 4-county Milwaukee SMSA in 1975.

## OTHER ADJUSTMENTS

### Adjusting for Multiple Job Holders and Unpaid Absences

To derive the total employment concept by occupation used by BLS, it was necessary to eliminate dual job holders within each industry from PROJECT VISION's employment estimate. In this way the number of individuals employed versus the number of jobs was secured. Based on suggestions in Tomorrow's Manpower Needs, the above adjustments were made by using estimates of dual job holders found in Special Labor

Force Reports, Multiple Job Holders, for 1960 and 1965.[8] A national average of dual job holders in 1965 was estimated at approximately 5 percent. This overall average of 5 percent was deducted from employment estimates of all industries except durable and nondurable manufacturing industries, wholesale trade industries, and the entertainment and recreation industry. An estimate of 2 percent for dual job holders in the durable and nondurable goods industries was used. An estimate of 2.5 percent was used in wholesale trade industries. These percentages are slightly higher than percentages of dual job holders for these two industries derived from the Special Labor Force Reports on Multiple Job Holders. Nevertheless, in using these 2 percent and 2.5 percent estimates for manufacturing industries and wholesale trade industries, respectively, instead of the overall national average of 5 percent, a more reliable estimate of total job employment was probably secured. An estimate of 20 percent for dual job holders was used for the entertainment and recreation industry.

An estimate of 1.5 percent of unpaid absences based on Special Labor Force Report No. 69, "Labor Force and Employment in 1965,"[9] was multiplied by wage and salary data for 1960 and 1975 and then added to total employment to derive a total labor force concept.

## Estimates of Occupational Employment 1960-1975

(A Summary Statement Relating to Major Steps
Two Through Six Outlined on p. 161)

After projecting local industry employment for the Milwaukee SMSA by the procedures just described, the projection of occupational employment in the area is calculated as follows:

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[8] U.S. Department of Labor, Bureau of Labor Statistics, Special Labor Force Report No. 18, Multiple Job Holders in December 1960 (reprinted from Monthly Labor Review Oct. 1961); Special Labor Force Report No. 63, Multiple Job Holders in May 1965 (reprinted from Monthly Labor Review Feb. 1966); and Special Labor Force Report No. 90, Multiple Job Holders in May 1965 (printed in Monthly Labor Review Oct. 1967 as "Moonlighting: An Economic Phenomenon," by Harvey R. Hamel).

[9] U.S. Department of Labor, Bureau of Labor Statistics, Special Labor Force Report No. 69, "Labor Force and Employment in 1965," (reprinted from Monthly Report on the Labor Force, Dec. 1965).

STEP 2. Apply the BLS national occupational patterns to the local industry distribution for 1960 and 1957.

STEP 3. Add the occupational employment in each industry for each of the two years.

STEP 4. Apply these national patterns to each local industry, thus deriving ratios of 1975 to 1960 employment. The result amounts to a rate of change for each occupation based on the projected increase or decrease in the industry derived from estimates specific to the locality, and on the national occupational patterns.

STEP 5. Establish local estimates of employment by occupation from the 1960 decennial Census.

STEP 6. Apply the estimates of rate-of-change (from STEP 4) to the 1960 employment estimates (from STEP 5) to yield a 1970 estimate of employment level.

Details of all these steps are given in the Appendixes F1-F8. Perhaps the most important of these are Appendixes F1, F2, and F3, although all will be consulted if a serious effort is made to apply the method.

## CONSULTING LOCAL INDUSTRY EXPERTS CONCERNING RESULTS OF REGRESSION TECHNIQUES

A number of visits were made with major durable and nondurable manufacturing industry representatives, several representatives within the construction industry, and a few within trade, services and finance. Since the projection results secured by the use of regression analysis are considered as a "first approximation," an attempt was made to test the feasibility of using qualitative judgments on the part of local industry experts to adjust or qualify these first approximations of future employment by industry.

The selection of industry representatives was based on the collective judgment of an occupational analyst on the PROJECT VISION staff and a number of analysts on the Occupational Analysis Field Center staff. A number of employer representatives familiar with individual 3-digit SIC industries in such durable manufacturing industries as nonelectrical machinery (SIC 351, 352, 353, 354, 356) were contacted. Similar meetings were held for selected 3-digit SIC industries for the electrical machinery industry, transportation equipment industry, and the primary metal industry. A few consultations were made with representatives of nondurable manufacturing industries (for example, SIC 31, 27, 208, 201). Contacts were made with the Milwaukee Construction Industry Association and with selected trade, service, and financial and banking industry representatives. Based on this experience, it is estimated that a minimum of 20 man days would be required to consult with experts familiar with an adequate number of 3- and 4-digit industries located within a metropolitan area the size of Milwaukee.

Many employers and union representatives familiar with individual industries were found to be unable or at least hesitant to make judgments on long-term employment projections by 2-digit, and even in some cases, 3-digit SIC industries. Their qualitative judgment on probable growth patterns of employment within industries did not easily assist in a determination as to which of a number of regression techniques would predict best the employment for a given industry. The greater the SIC detail (4- and 3-digit SIC categories as against 2), the more specific were the responses of the experts to the projections for 1975 employment by industry which they were asked to comment on.

It is emphasized that qualitative judgments on the part of industry-wide experts concerning the quantitative projections (or first approximated projections) by industry, based on regression analysis, in PROJECT VISION's experience did not always assist the analyst in determining which of many projection techniques would afford the best predictions. This supports the opinions of a number of occupational analysts located within the Milwaukee SMSA as well as a number of industry experts who question the assertion made by certain writers on occupational projections that consultations with employer or other industry-wide association representatives is a viable means of judging the efficacy of one method of occupational requirements projection over another.

## RELIABILITY OF PROJECTIONS BASED ON MATRIX TECHNIQUE, METHOD A

The reliability of the projections based on BLS Matrix Technique, Method A depends in part on the underlying assumption that the occupational patterns within industries located in an SMSA such as Milwaukee are somewhat similar to the national patterns. It was the opinion of PROJECT VISION's occupational analyst, as well as that of a number of occupational analysts in the Wisconsin Occupational Analysis Field Center, that there would be a greater degree of similarity of occupational distributions, especially for durable manufacturing industries, between statewide industry employment and national employment than between the Milwaukee SMSA distribution and the national pattern. (See App. F4, pp. F11-F13, for factors to be considered in differentiating between occupational patterns of particular industries in the Milwaukee area versus national and possibly state-wide patterns. Also see App. F5, pp. F14-F17, for comments pertaining to the BLS Matrix Industry list and how it relates to the Milwaukee SMSA.)

There were a number of factors which caused occupational patterns in major Milwaukee industries (durable manufacturing industries) to be somewhat different from those in the country as a whole. The industry mix had also been changing at a somewhat different rate in Milwaukee than in the Nation. (See App. F5,pp. F14-F17, and App. F6, pp. F18-F20.) Differences between State and national trends tended to be less pronounced than between an SMSA the size and industrial mix of the Milwaukee area and the Nation.

Method A compensates in part for these factors by making use of estimates of local occupational employment for the base year of 1960. In using Method A, the change factor in occupational employment for the area (1975 employment by occupation divided by 1960 employment by occupation secured through procedures outlined in Steps 1-4 (p. 161) was multiplied by occupational employment secured for the locale from the 1960 decennial Census. However, this compensation is insufficient to guarantee an adequate degree of reliability in occupational projections for the area if the error or variance in the employment estimates for occupational employment differs significantly in magnitude or direction for 1960 versus 1975 (see App. F6).

## EVALUATION

### End Use of Results

An evaluation of the BLS Matrix, Method A as it applies to an SMSA or area having a population and industry mix similar to that of Milwaukee depends upon three essential considerations and upon the relationship each has to the other. These considerations are:

1. The potential use to which the employment projections by occupation will be put.

2. The degree of accuracy or reliability that is required to meet the needs of the user.

3. The resources required, the cost involved, and the likely availability of the expertise and data required by local personnel responsible for the projections.

It is the view of PROJECT VISION that a meaningful discussion of the feasibility of using the BLS Matrix technique to determine future occupational needs depends upon the identification of the specific user of this information, the use to which this information will be put, and upon at least an approximate measure of the benefit derived from using this methodology as opposed to other means of estimating future employment needs for particular occupations.

To illustrate, there may well be a number of cases in which economic planning agencies within a specific locale may be interested in the relative increase of employment by occupational grouping, or even for certain specific occupations, over a period of time as opposed to precise projections of employment needs by very specific occupational detail. In such cases, occupational needs estimates for 1975 may justifiably be based upon the extension of a time series covering 13 divisions of industry employment to 1975 instead of extending a number of trend lines covering 116 industries, 62 industries, or some number of industries between a 62 and a 116 breakout. Least-square regression techniques could be used to determine the best fitting trend line with which to project employment to 1975. It would then be relatively easy to factor 191 occupation coefficients by industry divisions by estimates of employment within these 13 divisions of industry. A labor market analyst and a number of statistical clerks could complete these projections within a few months at most. Data processing equipment would not be required.

Therefore, the potential use to which the data will be put determines in good measure whether or not precise information is desired. This in turn determines the effort required and the cost involved in using the BLS Occupation-by-Industry Matrix, Method A to project employment needs by occupation to the future. An example of the manner in which the cost can mount may be seen from the following example of the application of the method to detailed State employment figures.

In the Spring of 1969, a labor market research analyst with four years' experience in the Division of Research and Statistics of the Wisconsin State Employment Service used the BLS Industry-Occupational Matrix, Method A to project employment needs by occupation for the State of Wisconsin. A deliberative and almost exhaustive effort was made to determine the industry detail required to derive accurate estimates of employment needs by occupation. With part-time assistance from a graduate student in labor economics and from statistical clerks, time series were established for an 86-industry detail, for wage and salary employment estimates, for self-employed and unpaid family workers, and for government employees by industry. Regression analysis was to be made to determine a best method of projecting employment by industry to 1975 approximately 3-1/2 months after the beginning of the project. Establishment of projections for 191 occupations was expected to take, at most, another 1-1/2 months. No problems with computer programming were anticipated since problems were ironed out in the initial effort made for PROJECT VISION. (See App. F7, pp. F21-F25 for brief discussion and for regression analysis program used.) It was anticipated that this time might be increased if a decision were made to also use a 2-stage (weighted) regression scheme to estimate the equations to be used in projecting industry employment.[10]

The value of occupational needs projections to vocational education institutions depends in good measure on the occupational detail used. The more specific the occupational projection and the more relevant it is to entry level positions, the more useful it will be to local vocational educators in determining curriculum design and development. When and if the "n.e.c." occupational classifications are broken out in specific detail by industry in the BLS Matrix staffing patterns, the potential effective use of this data by local vocational educators will increase immensely. PROJECT VISION's current judgment is that the benefit to be derived from the use of these detailed occupational projections for curriculum design purposes is limited unless specific relationships are clearly identified between the total need for workers in any one occupation and the percentage of that need that can be supplied by vocational educators and other manpower training agencies. It is thought that the identification of such relationships is as important as, if not more important than, the need to estimate occupational needs that are due to replacement and net migration. There may well be an unjustified impression on the part of many that local vocational educators can clearly relate overall employment needs by occupation to the contribution that they can make toward meeting that need. Much time and effort are invested in attempting to attain reasonably accurate and comparable data on which to base occupational employment projections. Unless these projections enable local vocational curriculum planners to determine the actual needs for which they should prepare students better than do their present means of gauging training needs, the benefit derived from using the Matrix specifically for vocational educational curriculum planning purposes may be negligible.

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[10] For a discussion of this method, see "Occupational Manpower Requirements: Projections for the State of Illinois in 1975," by William Himmelbauer (Graduate School of Business, University of Chicago, July 1968) in Appendix F7, p. F23.

## Reliability of Estimates an Essential Ingredient

There is no question as to whether vocational educators on local and State levels want, and are even eager to receive, all information available concerning occupational needs in the future. At the same time, the benefit derived from the use of specific estimates of future occupational needs must be measured by whether or not these projections (1) will determine, at least in part, the fields and activities for which vocational schools shall train people, and (2) will lessen the over- or under-training response to actual needs that occurred before such projections were used. In the State of Wisconsin, during 1967 and 1968 when PROJECT VISION was undertaking its field work, judgments as to the design and enrollment capacity of curriculums at the local level were based on feedback from instructors (from past experience with specific programs, placement experience of students, and response of employers concerning the need and effectiveness of the specific training) and, to varying degrees, on the advice of professional, technical, and trade advisory councils and organizations.

In the determination of future vocational training requirements for the Milwaukee SMSA, the usefulness of any occupational projections derived by means of the BLS Occupations-by-Industry Matrix, Method A depends in a large measure on whether those responsible for curriculum design in the area schools can be made to have confidence in the reliability and appropriateness of the projections. A number of the area's vocational educators, on the basis of discussion with them, were quite candid in expressing their lack of confidence in estimates of future occupational needs that had been presented to them in the past. These estimates had been based on the standard Area Skill Survey technique. Therefore, if a different method is used to develop occupational requirements, curriculum planners will need to be convinced that the resulting projections made available to them will help to improve upon the methods or systems they currently use to determine the number of students to train for specific occupations.

In view of this, meetings were held with personnel involved with curriculum development at Milwaukee Technical College, which includes adult-vocational, apprentice, and technical and junior college divisions. Estimates of 1975 employment requirements for a small selection of occupations for the Milwaukee area were presented to them for comment. (See App. F8, pp. F26-F47 for complete projection data.) Estimates for 1970 and 1972 were secured by making simple interpolations between 1960 and 1975 data. It became apparent that curriculum designers were essentially concerned with short or intermediate term projections (two to five years). The State Board of Vocational, Technical and Adult Education would be interested in longer term projections such as a 10-year period for the purpose of planning for physical facilities in the Milwaukee area. For this specific purpose, projections based on extending trend lines for 13 divisions of industries as opposed to 62 industries, or 116 industries or some number in between, would most likely be adequate.

## Specific Occupational Detail Another Essential Ingredient

It is thought that the use of occupational projections for curriculum design and planning in the Milwaukee SMSA can be increased if, in addition to increased reliability, their occupational detail could be made more specific than had been the case up until the time when PROJECT VISION was conducting its field work. This would involve changing the detail used in the BLS Matrix to represent specific and detailed staffing schedules of industries. Also, it is believed that if the input data, that is, wage and salary, self-employed and unpaid family workers, and government employment by industry, are made more readily available and in greater industry detail in the future vocational educators would be more convinced of the reliability of the data. PROJECT VISION suggests that the more precise the occupational projections the greater will be the possibility that the local vocational educators (at least in the Milwaukee SMSA) will use the data to determine curriculum design.

## Area Size a Limitation on the Use of the Matrix Technique

If the ultimate purpose for using the BLS Occupation-by-Industry Matrix technique is the improvement of the vocational education curriculum to meet the occupational needs of an area more effectively, it is also suggested that areas smaller than a State (or smaller than large economic regions within a State or smaller than the very largest SMSA's) be advised not to attempt at this time to attain more precise occupational projections by the use of Method A. Until refinements are made in the occupational detail used in the Matrix, and until a central or regional office is established to handle computations and data processing for SMSA's of 250,000 or more (other than the very largest SMSA's), it is believed that there is only limited benefit to be derived from using the Matrix Method A with its very detailed industry breakouts, to eliminate or decrease the over- or under-response of vocational training programs to actual community needs.

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## CHAPTER IX

## REPLACEMENT DEMAND INFORMATION

### SUMMARY

Replacement demand information in a reliable form is either dependent on high-quality estimates of industry's future needs for selected occupations or on a reasonably accurate compilation of information concerning employees in individual establishments in a labor market area. In a SMSA the size of Milwaukee, with its diverse industrial composition, basic statistics of this nature are difficult to collect.

PROJECT VISION experimented with two techniques for estimating replacement needs using the Employer Needs Survey questionnaire to obtain the basic data. One technique simply asked employers to estimate replacement needs by occupation for one year (the coming year). (Test 1) The other technique requested employers to provide an age/sex breakout of current employment by occupation. (Test 2) The experiment revealed that, as presently designed, the techniques were seriously handicapped in several ways. These limitations are detailed in this chapter. Presented here are the implications of the findings for vocational education programming.

A significantly large proportion of the employers included in the experimental Employer Needs Survey chose not to answer the question pertaining to their probable need to employ additional workers for replacement purposes. Of the 1,174 questionnaires originally sent out, the overall initial return was 591 (50.3 percent). In Test 1 employers sampled responded at a rate of 37 percent on the replacement question; in Test 2, at a rate of almost 50 percent. Thus, only a small fraction of a sample carefully designed to be representative of the employers in the Milwaukee SMSA contributed to the final estimate on replacement needs. However, it is believed that the response rate would be higher from a mail survey with a simplified questionnaire and improved instructions for this item.

PROJECT VISION found that neither technique yielded quality results. The small response was one factor. Equally important and potentially more serious was evidence that the entries on many of the questionnaires were of doubtful accuracy. Both of the techniques are dependent in the first instance on reasonably accurate base figures from which estimates for the universe are derived. Skepticism about their source is a serious liability.

Public institutions charged with the responsibility for training an adequate number of appropriately qualified workers to meet industry's future needs require a reasonably sound numerical judgment as to its replacement demand. It is an important element of overall labor requirements and stands apart from the additional workers needed to meet the general growth of business in an area. Lack of an accurate guide can result in future shortages in certain categories of occupational skills. To a greater or less degree, employers would be in a position of having to "make do" and to improvise formal and informal in-plant training programs to meet their needs. This would result in a less economical functioning of the labor market than should be necessary.

Reports of experiments in this field follow.

## EXPERIMENTS WITH TECHNIQUES FOR ESTIMATING REPLACEMENT NEEDS

### 1. Definition of Replacement Demand

A major reason for continuously needing new workers in an establishment or industry is the necessity for "replacing" workers who leave the labor force for reasons such as death, retirement, disability or entry into the Armed Forces. A refinement of this concept becomes necessary when replacement needs for specific occupations are the subject of measurement. The added component is the need to replace workers who are promoted within an establishment from one occupation to another occupation of higher rank or greater skill. Since it essentially results in an upgrading process, the worker employed as the replacement may enter the work force of the establishment at some occupational level below that to which the promotion was made.

These facts are reflected in the formal definition for "replacement needs by occupation" used by PROJECT VISION. It was the same definition as that recommended by the Handbook on Employment Security Job Market Research Methods, Area Skill Survey, namely, "Those workers needed during the next year to replace those workers who will leave the occupation because of promotion, retirement, death, disability, withdrawal for military service."[1]

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[1] U.S. Department of Labor, Handbook on Employment Security Job Market Research Methods, Area Skill Survey, BES No. E-252 (GPO, Nov. 1965), p. 20.

## 2. Two Experimental Techniques for Estimating Local Occupational Replacement Needs

Persons responsible for estimating occupational "replacement needs" within a given labor market area have almost invariably run into difficulties. No simple, mechanical technique is available and generally accepted which provides the necessary data either on a national basis or for SMSA's. However, two techniques of promise have been developed by the Bureau of Employment Security for use by State Employment Services. Still in the testing stages, these techniques have been used throughout the United States.

Both of the techniques use the Area Skill Survey as the vehicle for assembling the basic data. One technique simply asks employers to estimate replacement needs by occupation for one year--the next calendar year. The other technique requests the employers to provide an age/sex breakout of current employment by occupation. Replacement needs are then calculated by Employment Service staff by applying labor force withdrawal rates found in the Working Life Tables[2] developed by BLS to selected age groups by sex.

Both techniques are of great potential value in that they are current in time and pertain to replacement needs in a specific locality. This has great relevance for persons responsible for developing vocational guidance programs. If the results derived can be relied on as being reasonably accurate estimates, they can then be accepted as one of the important measurable elements of local labor demand.

The value is "potential" because both techniques are to a degree controversial. Some research specialists who have made use of them are inclined to think that the use of the age/sex breakout method places such heavy demands on the respondents to a questionnaire based on the Area Skill Survey technique that overall response rates in such surveys are significantly lower than they would be if the question were not included. On the other hand, there are those who dispute employers' ability and willingness to provide reliable estimates of replacement needs by occupation.

Because of this controversy and because PROJECT VISION recognized the value of accurate estimates of replacement needs for training management purposes, both of the methods described above were tested in one of the experimental phases of the Employer Needs Survey. The test provided for the comparison of the rate of questionnaire response by selected employers in the Milwaukee SMSA under each of the methods. In addition, follow-up interviews were held with a number of employers which were designed to gauge the reliability of the replacement information they had furnished. The results of the two methods were then evaluated in terms of their viability for vocational education planning needs in the local labor market area.

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[2] U.S. Department of Labor, Bureau of Labor Statistics, Tables of Working Life: Length of Working Life for Men, Bulletin 1001 (GPO, 1950), and Tables of Working Life for Women: 1950, Bulletin 1204 (GPO, 1957).

## 3. Replacement Needs Estimated by Employers (Test 1)

### a. Methodology--Two Options

The Employer Needs Survey sampling procedure provided for a control sample and two subsamples of employers, Subsample A and Subsample B. Those employers in Subsample A were asked to respond to a questionnaire with an open-end occupational stub; those in Subsample B to one on which the occupations were prelisted. The employers in the Control Sample and in Subsample A were asked to respond to the same question with respect to replacement needs. The instructions on both forms read as follows:

> Replacement Needs. Enter the number of workers, by occupation, needed to replace those who will be promoted or will leave your establishment because of death, retirement, disability, or entry into the Armed Forces during the 1968 calendar year.
>
> If you are unable to make a judgment for the coming year please indicate the extent of replacement needs which occurred during the past twelve months, by occupation.

It should be noted that the employer was given a clearly stated option between giving a factual statement (for the past 12 months) or an estimate (for the 1968 calendar year). It was hoped by this means to secure figures within a tolerable range of error.

### b. Rate of Response to Request for an Estimate of Replacement Needs

A substantial number of employers included in the survey samples did not provide information on replacement needs. Table 16 (p. 191)

TABLE 16.--Number and Percentage of Responding Employers not Reporting Replacement Needs

By Major Industry Group and Size of Establishment
(Control Sample and Subsample A Combined)

| Major Industry Group | SIC Code | Total Number of Establishments | | | Number of Employees Per Establishment | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 4-49 | | | 50-59 | | | 100 or more | | |
| | | | | | Number of Establishments | | | Number of Establishments | | | Number of Establishments | | |
| | | Responding | No Report | Per cent | Responding | No Report | Per-cent | Responding | No Report | Per-cent | Responding | No Report | Per-cent |
| Contract Construction | 15-17 | 10 | 5 | 50 | 3 | 1 | 33 | 1 | 1 | 100 | 6 | 3 | 50 |
| Manufacturing | 19-39 | 129 | 37 | 28 | 11 | 5 | 45 | 9 | 5 | 55 | 109 | 27 | 24 |
| Transportation and Communication | 40-49 | 17 | 2 | 11 | 5 | 0 | 0 | 3 | 0 | 0 | 9 | 2 | 22 |
| Wholesale and Retail Trade | 50-59 | 153 | 40 | 26 | 67 | 32 | 47 | 53 | 4 | 7 | 33 | 4 | 12 |
| Finance, Insurance, and Real Estate | 60-67 | 28 | 7 | 25 | 13 | 4 | 30 | 1 | 0 | 0 | 14 | 3 | 21 |
| Services | 70-89 | 79 | 27 | 34 | 39 | 16 | 41 | 10 | 4 | 40 | 30 | 7 | 23 |
| Federal, State, and Local Government | 90-93 | 48 | 13 | 27 | 5 | 2 | 40 | 6 | 1 | 16 | 37 | 10 | 27 |
| Total | | 464 | 131 | 28 | 143 | 60 | 41 | 83 | 15 | 18 | 238 | 56 | 24 |

shows the industrial makeup and size of the establishments which did not respond to the inquiry. Of the total of 464 firms responding in whole or in part to the survey questionnaire, 131, or 28 percent, did not make any estimate of their replacement needs. In addition, of the 333 employers who did provide an estimate, 88 (23 percent) indicated that they did not anticipate hiring any workers as replacements as defined by the Area Skill Survey (Table 17, p. 193). In summary, nearly half of all survey respondents (219 out of 464, or 47 percent) either provided no information on replacement needs or maintained that they did not expect to hire workers as replacements in the coming year.

It can be seen from Tables 16 and 17 that employers in certain major SIC industry groups, as well as those with establishments of a certain range in size, had more difficulty than others in dealing with the question of replacement needs. Of the manufacturing firms responding, 42 percent either provided no information on replacement needs or indicated that they would have no replacement needs during 1968. In Wholesale and Retail Trade (4-49 employees) 76 percent did not answer the question or anticipated not hiring for replacement purposes. Among Service establishments, 74 percent of the small firms (4-49 employees) and 47 percent of the larger firms (those with 100 or more employees), did not answer or said they did not expect to hire replacement workers. The replies were similarly inconclusive from 49 percent of the large government agencies -- those with 100 or more employees. It is suggested that many of the firms that did not anticipate hiring any workers for replacement purposes as stated on the questionnaire (Table 17) were in reality not answering the question at all. Note, for example, that 12 manufacturing firms with 100 or more employees said they would have no replacement needs.

### c. Evaluation of Replacement Demand Information

The preceding discussion has demonstrated that a significantly large proportion of employers chose not to answer the question pertaining to their probable need to hire additional workers for replacement purposes. This negative reaction weakened the base on which the area-wide estimates were developed. In turn, it has serious implications for those public institutions charged with the responsibility for preparing an adequate number of appropriately trained workers to meet an important segment of local industry's worker needs. It can result in future shortages in certain categories of occupational skills unless this method, or some other means of arriving at replacement demand projections, can be made to be productive of valid estimates.

TABLE 17.--Number and Percentage of Employers Reporting Replacement Needs Who Planned No Replacements

By Major Industry Group and Size of Establishment
(Control Sample and Subsample A Combined)

| Major Industry Group | | Total Number of Establishments | | | Number of Employees Per Establishment | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 4-49 | | | 50-99 | | | 100 or More | | |
| | | | | | Number of Establishments | | | Number of Establishments | | | Number of Establishments | | |
| | SIC Code | Reporting | No Replacements Planned | Percent | Reporting | No Replacements Planned | Percent | Reporting | No Replacements Planned | Percent | Reporting | No Replacements Planned | Percent |
| Contract Construction | 15-17 | 5 | 1 | 20.0 | 2 | 1 | 50.0 | - | - | - | 3 | 0 | - |
| Manufacturing | 19-39 | 92 | 17 | 18.5 | 6 | 3 | 50.0 | 4 | 2 | 50.0 | 82 | 12 | 14.6 |
| Transportation and Communication | 40-49 | 15 | 2 | 13.3 | 5 | 0 | - | 3 | 1 | 33.3 | 7 | 1 | 14.3 |
| Wholesale and Retail Trade | 50-59 | 113 | 29 | 25.7 | 35 | 19 | 54.3 | 49 | 4 | 8.2 | 29 | 6 | 20.7 |
| Finance, Insurance, and Real Estate | 60-67 | 21 | 5 | 23.8 | 9 | 5 | 55.5 | 1 | 0 | - | 11 | 0 | - |
| Services | 70-89 | 52 | 22 | 42.3 | 23 | 13 | 56.5 | 6 | 2 | 33.3 | 23 | 7 | 30.4 |
| Federal, State, and Local Government | 90-93 | 35 | 12 | 34.3 | 3 | 2 | 66.7 | 5 | 2 | 40.0 | 27 | 8 | 29.6 |
| Total | | 333 | 88 | 26.4 | 83 | 43 | 51.8 | 68 | 11 | 16.2 | 182 | 34 | 18.7 |

What were the underlying difficulties in this procedure, tested by PROJECT VISION, which was designed to obtain from employers themselves reliable information on replacement needs by occupation? Several of the most important are discussed herewith.

## Effect of Instructions

One of the recognized fundamental difficulties in securing information by means of a mail questionnaire survey such as that undertaken by PROJECT VISION is the stumbling block of definitive instructions. It has been demonstrated many times over that even explicitly worded questions are subject to misunderstanding. Moreover, those questions which assume understanding of refined technical concepts run the risk of being unanswered by the respondent because he lacks the relevant knowledge. In Test 1 both of these difficulties arose in connection with the replacement needs question on the survey questionnaire.

The term "replacement needs" was found to be foreign to most personnel departments. From the study of the returned questionnaires and follow-up interviews with more than 100 of the respondents, it became obvious that most of the employers who gave information on replacement needs apparently considered turnover rates and replacement needs to be synonymous. In contrast to replacement needs as defined in the instructions (see p. 190 above), a turnover rate as commonly used in industry and by labor economists is defined as the gross movement of wage and salary workers into and out of jobs with respect to individual firms. Turnover rates include "quits" whereas, in order to avoid double counting, the replacement need concept excludes "quits." For example, the survey was designed to exclude from its count a machinist leaving one firm to work in another at the same occupation. It was a basic flaw in the instructions that this difference was not referred to and spelled out. A few selected comments will illustrate the nature of the misunderstanding.

> Plumbing and Heating Firm: "Included simply last year's entire turnover in the trades requested."
>
> Large Manufacturer: "Considered all separations for any reason as replacement needs. Done by department and not occupations."
>
> Hospital: "Included quits. However, for nurse's aides, turnover rate was so high that no records were kept; just hire continually."

> Utility: "For area skill survey, we used broad job classifications. Estimated replacement needs since personnel department does not keep records by occupation. We felt data was not meaningful. Too many job classifications to estimate replacement needs by occupation."

Although the misunderstanding was not limited to firms of any particular size, there was an additional difficulty in the case of many small establishments without personnel departments. In such firms the individuals filling out the questionnaire were often unfamiliar with either term. As a result, in many cases they reported that no one was expected to leave; in other cases, they failed to answer the question. Another variation of the general problem occurred in the foundry industry. These firms did not report turnover rates but reported only those separations that were the results of retirements. It is suggested that turnover is so high in many occupations in the industry that it is not calculated or publicized.[3]

Information from some of the larger firms introduced still another type of error. There were instances among such establishments in which turnover rates were submitted for departments rather than for specific occupations. It became necessary for analytical purposes to estimate turnover by occupation from an overall department rate.

### A Problem Unique to the Contract Construction Industry

A relatively poor response rate to the Employer Needs Survey questionnaire characterized the firms in the Contract Construction industry in the Milwaukee SMSA.[4] PROJECT VISION had difficulty in identifying the reasons for this. Apparently, however, the need to prepare an estimate of replacement needs was a contributing factor.

Interviews with seven contractors and subcontractors revealed stable, small work forces in their front offices. In contrast, there was constant turnover among their skilled employees resulting from varying degrees of success in a firm's bids for jobs and the size of the jobs undertaken. Craftsmen in the industry are attached to a geographic labor market and not to a single employer with the exception of a select few master craftsmen retained from year to year.[5] Therefore, craftsmen come and go between firms depending on where the union sends them. Few contractors keep records of the age of their skilled workers or retirements. Thus, it was practically impossible for many, if not most, contract construction firms to answer a question on replacement needs. Unfortunately, union records were likewise inadequate for the purposes of the Employer Needs Survey.

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[3] See Chapter V, pp. 128-130, for a discussion of employment in the foundry industry.

[4] See Chapter IV, pp. 50 and 51.

## Effects of Questionnaire Design

Although it is impossible to prove statistically, interviews with employers suggested that PROJECT VISION's comprehensive survey form came as a shock. It is conjectured that the demand placed on an employer attempting to answer the questionnaire in full was of such magnitude that it had a tendency to result in shoddy work on one part or another, and in a reluctance to study a full page of instructions before undertaking the task. It has been agreed by PROJECT VISION's staff that if mail skill surveys were designed with a less complex, briefer form and improved instructions, the chance of obtaining adequate information on replacement needs from employers in an area as large as the Milwaukee SMSA could be increased.

## Effect of Option Employed

It will be remembered that employers were given an option as to the base on which their estimate of need for replacement workers by occupation could be prepared. The method of choice was for the employer to prepare a projection for the next calendar year. The less desired alternative method was to use the firm's replacement experience during the 12 months preceding the survey. In order to evaluate the relative effectiveness of each method, PROJECT VISION undertook structured interviews with 68 of the employers who had provided information on replacement needs. Their answers leave no doubt that a larger, more reliable response can be obtained from the use of records of past experience.

The representatives of responding firms interviewed were asked whether, in fact, available past records had been used for the estimate. The answer was clearly "yes." Fifty of the 68 employers interviewed said they had used past records exclusively in estimating replacement needs. A number of them commented that they had done so because it was impossible to predict replacement needs for the year ahead.

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[5] Jack Barbash, American Unions: Structure, Government and Politics (Random House, 1967).

### 4. Replacement Needs Estimated From Age/Sex Breakout of Current Employment (Test 2)

#### a. Methodology

In addition to Test 1, "Replacement Needs Estimated by Employers," PROJECT VISION undertook to test a second method preparing estimates of employers' replacement needs. Information on current employment in sample establishments (Subsample B) was collected for this particular purpose in the Experimental Skill Survey. The method involves applying separation rates by age and sex for the United States to the current employment figures classified in the same way. Working Life tables[6] developed by BLS provided the necessary separation rates.

The age groups for each occupation on which the calculations were based were very broad, namely, under 35, 35-54, and 55 years and over. Since Working Life tables present their figures for men and women separately, the Milwaukee area Employer Needs Survey age group figures were assembled separately for men and women. It was thus possible to calculate separation rates for each occupation covered by the survey for which information had been obtained.

#### b. Limitations of BLS Working Life Tables

The working life of people employed in each occupation differs. For example, people pursuing a career in most professional occupations have a longer working life pattern than people employed in clerical occupations. Again, the working life of a policeman or firefighter is, on the average, shorter than that of a skilled craftsman, and he, in turn, tends to have a shorter working life than either a doctor or a lawyer. Since the occupations of professional people are not so physically demanding, they usually practice their professions longer than do blue-collar workers.

#### c. Rate of Response to Request for Current Employment by Age and Sex

Two hundred and sixty-four employers in Subsample B of the Experimental Employer Needs Survey received the mail questionnaire which requested the age and sex of their workers currently employed in selected prelisted occupations. Of this number, 127 (48 percent) returned the questionnaires or parts thereof. This compares favorably with a return of 50 percent in the Control Sample (326 out of 646). Also, since the age/sex breakout was the only variance from the Control Sample, it seems to indicate that the employers on the whole were not unduly burdened by this particular request. Further, substantiation lies in the fact that of the 127 who returned the questionnaire, only 18, or 14 percent, failed to give some figure for the age and sex of their employees (see Table 18, p. 199).

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[6] See footnote 2, p. 189.

Table 18 presents the distribution of the returned questionnaires in establishments of different sizes and major SIC groups. It will be noticed that overall the size of the establishment played little part in the rate of response to the age/sex breakout request. However, there were marked differences in the proportionate returns among the major industry groups. For example, all Contract Construction[7] and Finance, Insurance, and Real Estate firms reported the age and sex of their employees. In contrast, a little over one-fifth (22 percent) of both Service businesses and Government establishments failed to furnish this information.

Although it had been presumed that the response rate on this question would be lower than it actually was because some employers expressed reservations during the pretest, the rate of return of 48 percent should not preclude an inquiry into the reasons for non-response. A number of employers commented on the problems involved and the manner in which they met them. Among the larger establishments, for example, the persons preparing the mail questionnaire would know the office personnel and their approximate ages. On the other hand, the ages of the shop workers were not readily available. To compile them by occupation entailed a great deal of work, either necessitating hand-sorting of the personnel files or securing the information from individual foremen. A number of employers commented that this kind of effort involved considerable time and expense, and that they could not see personal benefit from it.

### d. Reliability of Responses to Request for Age/Sex Breakout

Some methods of meeting the problem were statistically questionable. In several instances all employees entered on one

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[7] See section 3(c) of this chapter (pp. 195-196) for estimating problems unique to the Contract Construction industry. The returns in this instance probably pertain to "front office" employees.

TABLE 18.--Number and Percentage of Responding Employers not Reporting Age/Sex of Current Employees By Major Industry Group and Size of Establishment

| Major Industry Group | SIC Code | Total Number of Establishments |  |  | Number of Employees Per Establishment |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | 4-49 |  |  | 50-59 |  |  | 100 or more |  |  |
|  |  |  |  |  | Number of Establishments |  |  | Number of Establishments |  |  | Number of Establishments |  |  |
|  |  | Responding | No Report | Per cent | Responding | No Report | Per cent | Responding | No Report | Per cent | Responding | No Report | Per cent |
| Contract Construction | 15-17 | 6 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 |
| Manufacturing | 19-39 | 42 | 7 | 17 | 2 | 1 | * | 5 | 0 | 0 | 35 | 6 | 17 |
| Transportation and Communication | 40-49 | 8 | 1 | 13 | 3 | 0 | 0 | 1 | 1 | * | 4 | 0 | 0 |
| Wholesale and Retail Trade | 50-59 | 29 | 3 | 10 | 20 | 2 | 10 | 5 | 1 | * | 4 | 0 | 0 |
| Finance, Insurance, and Real Estate | 60-67 | 10 | 0 | 0 | 5 | 0 | 0 | - | - | - | 5 | 0 | 0 |
| Services | 70-89 | 23 | 5 | 22 | 9 | 2 | 22 | 4 | 1 | * | 10 | 2 | 20 |
| Federal, State, and Local Government | 90-93 | 9 | 2 | 22 | 1 | 1 | * | 1 | 0 | 0 | 7 | 1 | 14 |
| Total |  | 127 | 18 | 14 | 42 | 6 | 14 | 17 | 3 | 18 | 68 | 9 | 13 |

*Numbers too small to yield significant percentage.

page of the questionnaire were placed in one age bracket; all those on another page were grouped in a different single age bracket. In other instances, employers mentioned that since they could not sift through their files to get the information, they made an "educated guess." One company employing more than 600 workers used this "method." For another firm with over 350 employees, the information was entered by the employer "from memory." These examples are not presented in order to invalidate the results but to contribute knowledge on one of the problems arising from use of mail questionnaires as a basis for estimating replacement needs by occupation. However, a reason for using this method might be that responding with an educated guess is better than not returning any information at all, which happened more frequently in Test 1.

## COMPARISON OF RESULTS OF TWO EXPERIMENTAL TECHNIQUES

The tests undertaken by PROJECT VISION to evaluate the two techniques for deriving reliable estimates of replacement needs by employers in a SMSA revealed aspects of the methods that are open to criticism. Fortunately, some of the underlying difficulties can be alleviated in the formative stages of future Area Skill Surveys. Also, as some of the technical components of the methods become increasingly refined through further research efforts, the magnitude of the problems encountered in the Milwaukee Experimental Survey will be greatly reduced. In the meantime, it is indicated that the results of both techniques as tested by PROJECT VISION must be highly qualified before they can be used in a definitive way for vocational education program planning.

As designed, the method of quantifying replacement needs by occupation for a SMSA from employers' estimates entered on a mail Area Skill Survey questionnaire (Test 1) was the more difficult of the two techniques to carry out effectively. The opportunity for respondents using this method to misunderstand the basic terminology is of special concern. The meaning of "replacement needs" was so unfamiliar to many respondents that the concept of "turnover rate" was almost unconsciously substituted for it. This weakness, which resulted in part from inadequate instructions, undoubtedly contributed to some employers' failure to respond to the overall questionnaire. No such problem of definition arose in the use of the Test 2 technique in which the age/sex breakout by occupation for current employees was basic.

Both techniques to a degree made use of employers' personnel records which in some respects generated difficulties of a like nature. In Test 1 some respondents reported replacement needs (or "turnover rates") by departments in the plant rather than for specified occupations. In Test 2, on occasion, all employees listed on a single page were bracketed in one age group. In other instances, the work on personnel records required to classify employees by occupation and by age and sex appeared to be so great that out-and-out guessing provided the answers. The underlying problem in both techniques was that many employers were being asked to use their records in ways for which they were neither designed nor readily adaptable. To satisfy an outsider's request, some entry was made on the mail questionnaire. This does not mean that as individuals the employers were indifferent to PROJECT VISION's need for reliable estimates. Many employers communicated with PROJECT VISION either to request clarifying instructions or to explain why the requested information couldn't be entered in the desired way.

Just as Test 1 had a unique definition problem, Test 2 had a special problem which for solution is dependent on further research by a Federal agency. The problem centers in the Working Life tables as currently developed by BLS. The estimate of replacement needs, using the application of an overall working life factor to an age/sex breakout for individual occupations, stretches the factor beyond its real capability. Fortunately, BLS is undertaking continuing research in order to prepare the working life of each occupation occurring in the 1970 decennial census. When these figures are available, one of the chief factors limiting the adequacy of this technique will have been eliminated.

In view of these several inadequacies, it is difficult to arrive at a judgment with respect to the preferred technique. However, when a judgment is made it must take into account the fact that both techniques are capable of being improved. PROJECT VISION's testing of the techniques in the context of the Experimental Employer Needs Survey in Milwaukee points to two important ways in which this may be done. These ways are briefly stated in the form of recommendations.

## RECOMMENDATIONS

### Simplify and Shorten the Standard Area Skill Survey Questionnaire

PROJECT VISION recommends this be done in order to increase the overall rate of response to the mail questionnaire survey. In so doing, it would also enable respondents to spend more time and effort on individual questions. Undoubtedly this would result in more adequate entries, particularly for such technical information as is required for estimating replacement needs by whatever method.

## Refine the Definition of "Replacement Needs"

It is essential, in designing future mail skill survey questionnaires that request an estimate of the number of employees who will be required to meet "replacement needs," that a more refined definition of the term be used. It should explain the replacement concept vis-à-vis "turnover rate," which is a broader term that includes persons who "quit" or leave the employ of a company in addition to those who need to be replaced for such reasons as death, retirement, disability or entry into the Armed Forces.

# CHAPTER X

# SOURCES OF SUPPLY FOR ENTRY-LEVEL OCCUPATIONS

## SUMMARY

At the time PROJECT VISION undertook to study the availability of data pertinent to portraying the universe of young people entering the Milwaukee area labor market, the current practices of record-keeping among the supply sources were not capable of yielding overall data that could be put to practical use for vocational education curriculum planning. In order to develop a comprehensive information system which could lead to an optimum meshing of employers' needs for trained workers at entry-level occupations with the potential supply of graduates from training institutions, it was found that the most basic reports would have to be developed by the institutions and that a willingness on their part to cooperate to meet the local labor requirements would be essential. The most important finding was that however similar or diverse the training was in the individual schools, no one seemingly collected data on combined output and no source was found that would yield the extent of training in any given curriculum area.

The preparation of young workers qualified to meet the occupational needs of local employers would be greatly enhanced, both to their benefit and to the benefit of industry, if curriculum planning could be undertaken on more realistic grounds. With this objective in mind, recommendations are offered at the conclusion of this chapter which local training institutions might wish to consider. At the same time, PROJECT VISION sees an immediate role for the Employment Service in the further development of a "Common Occupational Language." The description of an initial effort by PROJECT VISION toward this end is included in this chapter.

## SIGNIFICANCE OF LABOR SUPPLY POTENTIALS FOR VOCATIONAL EDUCATION PROGRAMMING

In any labor market area, the employers' current and future need for workers is met from within the total universe of people available and likely to be available to meet specific occupational needs. The more nearly those persons qualify for the job openings, the greater will be the effectiveness of the employed work force and hence the overall productivity of the area. The potential sources of labor are numerous, with the size and character of the supply always in a state of flux. Employers drawing on this pool can be well served by vocational education establishments when such establishments are able to plan their curricula and the size of their classes in terms of expressed labor requirements. In optimum terms, there should be a meshing of the graduate trainee with an appropriate job in the occupational field of his choice.

Having said this, it must be recognized that graduates of technical and vocational courses cannot and are not expected to be the only source of supply for the wide range of employers' occupational needs. What general characteristics do the other sources of supply have? What is the relative importance numerically of the vocational education training programs in meeting employers' needs? Can they be expected to play a more vital role in the future if they can be provided with reasonably accurate projections of occupational requirements in a given job market?

In this chapter and in Chapter XI components of the labor supply universe will be described together with the limitations in adequately taking their measure at the time of the Experimental Employer Needs Survey. In the course of this presentation, vocational education training programs and their contribution to the Milwaukee SMSA labor force are discussed, accompanied by a recommendation that, whenever possible, procedures be adopted that would provide information on the degree to which the graduating students were placed in jobs related or closely allied to their area of training.

This chapter will be concerned with those persons, primarily in young age groups, who are entering the labor force for the first time. Following this, Chapter XI will treat those sources of labor supply that yield workers possessing varying types of work experience.

## EDUCATIONAL BACKGROUND OF NEW ENTRANTS

A discussion of labor supply at any point in time involves an analysis of the employed workers plus the currently unemployed people who are looking for work. One change that occurs with time is the natural increase in and aging of the population. Just as aging causes retirement and death, and thereby creates replacement demand, aging also brings about additions to the labor force as younger members of the population reach working age. Although characterized by well-defined seasonal patterns, untrained or newly trained young people are, except in periods of severe economic depression, the major component of the unemployed population looking for work. What are some of the avenues by which they come to participate in an area's economic life?

## Secondary School Dropouts

PROJECT VISION was cognizant of the fact that young people leaving secondary school before graduation frequently do so in order to enter the labor market. However, it was not feasible to undertake any study of the relative size or current number of these new workers during the 1967-1968 school year in the Milwaukee SMSA.

## Graduates of High Schools and Public and Private Vocational Schools and Technical Institutes

PROJECT VISION undertook to survey all known high schools, public and private vocational schools, and technical institutions in the Milwaukee SMSA in January 1968, six months after the Experimental Employer Needs Survey was conducted. The mail questionnaire form used was kept brief in the hope that a better response rate would result than was obtained from a similar survey taken in 1966 by the Milwaukee Metropolitan Association of Commerce.

On the form (see App. G, p. G3), the institutions were asked to provide data on (a) number of graduates by curriculum for 1967 and projected estimates for 1970 and 1972, and (b) class capacity for the same time periods.

Although it would have been desirable to obtain a breakdown between the high school graduates planning to go on to college or to obtain other post-high school education and those graduates not expecting to immediately obtain further formal education or to enter military service, this was not requested. In any given year this latter figure, if available for an area, could be used as a rough approximation of a larger segment of the new entrants into the labor market.

The list of institutions surveyed was obtained from the 1966 Association of Commerce survey and the classified telephone directory. If from that survey the courses taught at an institution were know, course titles were added. Of the approximately 70 institutions surveyed, nearly 60 responded with partial data.

(For details, see "Supply" figures for selected industry groups in App. H, pp. H7-H15.) No formal follow-up of nonrespondents was conducted, although several were reached by telephone or in person.

The results of the study were quite meager. A number of administrators did not respond, or responded only in part, because they said they could not foresee budget levels for curriculum areas, or because, not knowing future training demand, they could not predict the number to be trained. As a result, the projections of graduates and class capacity were often of dubious quality, a fact that was acknowledged by some of the school administrators.

Other results of the study raise serious questions relating to vocational training programming. It is well known today that increased technology in industry makes vocational courses an important input in the development of the entry level labor supply. In spite of this, PROJECT VISION found that little was being done in the Milwaukee SMSA to coordinate efforts or to compare results. However similar or diverse the training was in the individual schools, no one seemingly collected data on combined output and no source was found that would yield the extent of training in any given curriculum area. It was quite evident that the competitive spirit among the school administrators in this field was in some measure responsible for this unfortunate situation.

Another equally serious omission, one which prevented evaluation of the ongoing programs in relation to employers' occupational labor requirements, was that the schools kept no follow-up records on their graduates. It was not possible to find any compilation of the number of graduates of a particular course entering a training-related occupation.

## Apprenticeship Programs

The apprenticeship programs in the Milwaukee SMSA are an important potential source of entry-level workers. Today, in the vast majority of cases, they constitute the avenue into apprenticeable occupations. Records available at the State Apprenticeship Division's office over a 20-year period provide on an annual basis the number of students entering various apprenticeship programs, the number of graduates in the current year by occupation, and, importantly, the dropout rate by program. PROJECT VISION, on the basis of these records, estimated the number of expected graduates for the years 1970 and 1972 by adjusting the number of students entering a course by the dropout rate. Although this kind of knowledge can be a valuable administrative tool, it was not obtained by the Apprenticeship Division for use in its daily operation. If it were available routinely, it could also be of material interest to vocational school administrators.

### MDTA Training

The MDTA (Manpower Development and Training Act) program offers one of the most clear-cut, easily discernible sources of supply information in the Milwaukee area, particularly since good follow-up data are available. Accurate data were easily obtained for PROJECT VISION from the State administration office of the Employment Service. A summary table in Appendix H (p. H16) presents for 1967 the occupational curricula of the trainees, together with the number who were placed in training-related occupations.

### Other Educational Sources for New Entrants Into a Labor Market

It must not go without mention that many young people starting their working life have had other types of post-high school education or training than those which have been touched on briefly. In an area as large as the Milwaukee SMSA, there are each year graduates of local 2- and 4-year colleges, religious educational institutions, medical schools, musical and art schools, and a varied number of others. In one way or another many of these students flow into the Milwaukee labor market. PROJECT VISION made no effort to obtain the basic data necessary to estimate their number at the time of the survey or to judge the size of the group on a recurring basis.

## ENTRY-LEVEL LABOR SUPPLY RELATED TO EMPLOYERS' OCCUPATIONAL REQUIREMENTS

One of PROJECT VISION's important undertakings in its labor market study of the Milwaukee SMSA was based on the findings of its analysis of the potential entry-level labor supply and employers' anticipated occupational requirements as portrayed in the Experimental Employer Needs Survey questionnaire. Within the stringent limitations of the basic data, it was an attempt to line up side by side occupational supply and demand data in order to reveal areas of current or potential occupational shortages. It was hoped that some, if not all, of the specific relationships uncovered would have significance for vocational educators and for employers seeking trained workers, and would possibly lead to enlarged areas of technically sound communication between them.

## Scope and Methodology

The supply data, as described earlier in this chapter, were obtained from MDTA and apprenticeship program official records, hospitals, and from selected area schools (high schools, private business and technical schools, and public vocational schools). The occupational demand data were obtained from findings of the PROJECT VISION Experimental Employer Needs Survey.

One of the most important phases of the procedure was the preparatory grouping of data by occupational areas in order to obtain corresponding occupational groups from the disparate occupational listings of school graduates used by PROJECT VISION. The final lists of occupational areas with the accompanying forecasts of labor requirements and the estimated number of young trainees expected to be available are to be found in Appendix H (pp. H6-H15). An example of this tabular presentation of material is presented for "Selected Data Processing Occupations" (Chart II, p. 209).

The basic occupational requirement data in the demand-supply comparison related to 90 occupations of the nearly 200 contained on the prelisted occupational stubs used on the Milwaukee Employer Needs Survey mail questionnaire. These 90 occupations were selected because the information for them, as submitted by the employers, was found to be the most accurate and valid in terms of current and anticipated employment.[1] In most instances, labor union and decennial Census data were used as sources for validating the employment information.

For the most part, the occupations having reliable data had the following characteristics: The majority were interindustry occupations (with the exception of those pertaining to Printing and Publishing), and were found in both large and small establishments. Although they were on the prelisted occupational stub in the first instance, they were likely also to be found on the open-end stubs included in the sample on which employers themselves listed the occupations on which they would report.

Certain occupations were combined in the demand presentation (for example, "Other Draftsmen"), so that the 90 occupations were reduced to approximately 80 titles in the final list. Supply

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[1] Technical problems related to employer response were the principal reason for excluding the remaining 110 from the final analysis. Response errors and lack of response for certain occupations by too many employers caused most of the deletions.

# CHART II
# SCHOOL SURVEY SUPPLY DATA AND SKILL SURVEY DEMAND DATA SELECTED DATA PROCESSING OCCUPATIONS[1]

| DOT CODE AND TITLE | | HEW CODE AND TITLE | |
|---|---|---|---|
| 012.168 | Systems Analyst, Business-Electronic-Data Processing | 14.02.04 | Systems Analysts |
| 020.188 | Programer, Engineering & Scientific | 16.01.17 | Scientific Data Processing |
| 020.188 | Programer, Business | 14.02.03 | Programers |
| 213.382 | Digital-Computer Operator (Console Operator) | 14.02.01 | Computer & Console Operators |
| 213.382 | Computer-Peripheral Equip.Op. | 14.02.02 | Peripheral Equipment Oper. |
| 213.382 | Card-Tape-Converter Oper. | 14.02.02 | Peripheral Equipment Oper. |
| 213.582 | Key-Punch Operator | 14.02.02.01 | (14.09.02) Key Punch & Coding Equipment Oper. |
| 213.782 | Tabulating Machine Operator | (Related to 14.02.02 and 14.09) | |

DEMAND

| | Estimated Employment | | | Est. Replacement and Expansion Needs - Per Year | |
|---|---|---|---|---|---|
| | 1967 | 1970 | 1972 | 1967-70 | 1970-72 |
| Systems Analyst | 660 | 890 | 1030 | 190 | 180 |
| Programer, Engrg.& Scien. | 40 | 80 | 120 | 50 | 60 |
| Programer, Business | 860 | 1100 | 1260 | 360 | 360 |
| Console Operator | 610 | 800 | 910 | 160 | 150 |
| Peripheral Equip.Oper. ) | 300 | 350 | 370 | 40 | 30 |
| Card-Tape Operator ) | | | | | |
| Key-Punch Operator | 2540 | 2840 | 3090 | 440 | 470 |
| Tabulating Machine Oper. | 300 | 370 | 390 | 80 | 70 |

SUPPLY

| | Estimated Graduates | | |
|---|---|---|---|
| | 1967 | 1970 | 1972 |
| Computer Programing | 250 | 550 | 1050 |
| Data Proc. Technicians - (Business Programers)* | 25 | 50 | 60 |
| Console Operators | 102 | 138 | 170 |
| Console Operators and Peripheral Equip. Op. | 400 | 700 | 1000 |
| Computer Peripheral Equip.Op. | 90 | 110 | 135 |
| Key-Punch Operator | 520 | 750 | 760 |

*Course estimate from one area vocational school. All other estimates supplied by private business or technical schools. The above course listing reflects variation in course content among responding schools.

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[1] Source: Sample from Appendix H, p. H10.

figures from more than one source were combined when there was some reasonable basis for assuming the courses were similar in content and length. Often, however, the figures from similar sounding courses have been listed separately.

In presenting supply data in conjunction with some of the findings from the Employer Needs Survey, it was not possible to match supply with demand because the sets of figures were not strictly comparable and the terminology problems seemed insurmountable. However, the two types of data are presented alongside each other in a form that permits some comparison and that illustrates the formidable problems involved in collating the supply-and-demand data as obtained by PROJECT VISION.

A conscious effort was made to break the communication (terminology) barrier between occupational titles and vocational course listings by including related DOT occupational codes and titles and HEW curriculum codes and titles. Data were grouped by occupational areas such as Data Processing, Health Occupations, and Engineering and Technical occupations. For each occupational area the following data are presented:

1. DOT CODES AND TITLES
2. HEW CURRICULUM CODES AND TITLES
3. DEMAND DATA (Occupational titles, current and projected employment, estimated expansion and replacement needs per year -- from Employer Needs Survey results)
4. SUPPLY DATA (Occupational or course listings and estimated graduates -- from area high schools, vocational schools, business schools, MDTA and Apprenticeship data)
5. EXPLANATORY FOOTNOTES (giving sources of supply data; terminology problems; problems in compiling and interpreting supply data, etc.)

DOT codes and titles were matched to corresponding HEW codes and titles, and are listed side by side at the top of each occupational section. As nearly as possible, the DOT codes and titles correspond to the occupational titles listed under DEMAND; and the HEW codes and titles correspond to the occupational listings under SUPPLY. Thus, in rather a roundabout way there was an attempt to match the dissimilar supply-and-demand occupational listings.

## Limitations and Results

The matching is necessarily imperfect since occupational titles mean different things to different employers, and they often mask varying job requirements. Similarly, like-sounding school courses differ considerably in length and content. Relationships are clearly there, however, which have significance for vocational educators and for employers seeking trained workers. In using DOT and HEW terminology, there was an attempt to establish some uniformity of language in order to point up these relationships.

Also, as indicated earlier, the demand-and-supply figures are not comparable. Demand figures represent expansion of survey results obtained from an occupational sample; supply figures represent exact numbers given by the limited number of respondents in the supply survey. The supply figures are admittedly inadequate since there was in effect no real attempt at follow-up of either respondents or nonrespondents.

Finally, it should be pointed out that the training institutions were asked on the questionnaire to state estimated capacity as well as the estimated number who could be expected to graduate in 1967, 1970, and 1972. The capacity data are not presented in this report. Since these would seem to be important, some explanation for this omission is required.

The principal reason rests in the fact that the variations in response rendered these data almost impossible to compile and interpret. Problems also pertained to the number of students graduating, but to a somewhat lesser degree. Examples of the kind of variations in the responses are outlined:

1. Some sources of supply provided no capacity estimates at all.

2. Some respondents did not provide for the three time periods and/or accompanied some of their estimates with multiple question marks.

3. Some respondents stated estimates in terms of class capacity, without indicating number of classes possible (one stated "25 at once" for 1970 and 1972).

4. Some respondents simply stated that capacity depends "on demand" (it appeared that some of the private training institutions also stated their graduate figures in these terms).

5. Some estimates were apparently fairly well reasoned out, while others appeared to be no more than broad guesses, creating considerable speculation as to what criteria, if any, were used in making the estimates.

6. As with the estimates of number of students graduating, there was the problem of course length and course content in trying to determine overall capacity for specific occupations or specific courses among several schools.

The capacity data can be summarized with these observations:

1. With few exceptions, capacity was much larger than anticipated graduates in all three time periods. It was apparent that capacity could meet a greatly expanded demand, especially in private business and training institutes and in high school clerical courses.

2. Capacity was considerably larger than anticipated graduates for: computer programming; stenographers; various engineering technicians; 2-year accounting; and welders. (In welding, however, the large capacity was nearly matched by the rather large number of graduates anticipated in 1970 and 1972 by a private welding school and in 1972 by a large area vocational school.)

3. Capacity was the same as, or only slightly larger than, anticipated graduates for nurse's aide/orderly; auto body; stationary engineer; machinists; tool and die makers; milling and boring machine operators; shapers and planers; and most Printing and Publishing occupations. (In some cases, such as machinists and some printing occupations, capacity was sometimes double the anticipated graduates, but the figures were very small; for example, 20 capacity compared to 12 graduates, or 6 to 3.)

## CONCLUSIONS AND RECOMMENDATIONS

"Demand for" and "supply of" workers in a labor market area, whether large or small, are technical terms which represent complex sets of factors that cannot be described by two numbers, one for demand and one for supply, that will lead to a sound base for programming training needs. Although at best both factors are difficult to appraise currently and in the future, and precise comparisons are hardly feasible as the measuring techniques are developed today, there still could be some advantage in comparing supply and demand approximations for selected occupations if only to spot clear and obvious imbalances. Chart II (p. 209), which presents an example of the comparisons made experimentally by PROJECT VISION, would seem to indicate an oversupply of graduates in the broad occupational field of data processing in the Milwaukee area during the latter part of 1967. Of course, in practice, some adjustment would have to be made for persons graduating from specific courses who do not enter the line of work for which they are trained. It is suggested that the imbalances of this degree found in this text are worth noting. Such imbalances, either on the demand side or on the supply side, might offer hints to educators that they would welcome.

PROJECT VISION's experience indicates that in the Milwaukee SMSA current practices of information retrieval from entry-level supply sources are not designed on an area-wide basis. Thus, it is not only difficult to judge the relative importance of any one source of new entrants to the labor market but it would be even more difficult to develop an overall area training program for meeting the continuing labor needs of the area's establishments if this were thought to be desirable.

PROJECT VISION could not make an evaluation of its experimental effort along these lines. Moreover, the results could not be refined to a degree that would enable them to be used by vocational educators to arrive at meaningful management decisions. Questions needing concrete answers must await the development of more refined techniques. Can techniques be developed that will provide answers to such questions as: Is there a training need? Is the public vocational education system responsible for training a particular number of workers? What direction should the training programs take? How should the curricula be designed to meet the entry-level labor needs in the area?

These questions could not be answered by PROJECT VISION's data. There are those who maintain that the number of individuals being trained related to the number of workers in demand is all that is required. PROJECT VISION disagrees. It suggests that the demand-and-supply comparisons can become more meaningful if the following suggestions are considered:

1. Training institutions organize a data-collection system as well as follow-up system on a year-to-year basis that will provide all educators in the community with compilations on the extent of training by curriculum area.

2. State Apprenticeship departments be included in this data-collection system.

3. The number of military returnees be collected by occupation or training desired under the GI Bill of Rights at the local level and made a part of the labor market information system.

4. Antipoverty agencies and MDTA training personnel also submit data on the number of graduates and the findings of follow-up programs.

5. Urban vocational schools employ a full-time staff person to contact local industry, conduct surveys, etc., so that the schools can better understand training preferences in industry.

# CHAPTER XI

# SOURCES OF SUPPLY FOR EXPERIENCED WORKERS

## SUMMARY

Among the unemployed but experienced people, the range of employee acceptability varies widely, depending on the degree to which their employment characteristics meet the requirements of the current job openings. Among employed workers whom employers expect to promote and upgrade, there is frequent need for specialized training. Public vocational education has a unique opportunity to participate in the fulfillment of this two-way need. Its ability to do so can be advanced if those in charge of program development can be advised periodically of the employment characteristics of some, if not all, persons in this pool of workers. The purpose of PROJECT VISION's undertaking in this regard was to find a method, or methods, of delineating the group for training purposes.

PROJECT VISION explored a number of avenues which might be expected to yield information on potential sources of occupationally qualified workers, both employed and unemployed, in the Milwaukee SMSA. It is disappointing to report that the results of the inquiries were meager, although several types of information could probably be made useful with certain modifications and advanced planning and funding.

Among the resources that could profitably be explored further are the records for returning veterans collected routinely by the Veterans Administration Service and distributed to the veterans' representatives in the local Employment Offices. As now set up in the Milwaukee office, retrieval of occupational background data for these men and women is time consuming. However, the data are there in some detail and it would be eminently worthwhile to explore possible collection procedures further.

Although PROJECT VISION went to considerable lengths to analyze placement records of persons applying at the Youth Opportunity

Center, and derived some interesting information from them relating to occupational transfers, it is realized that this initial effort did not begin to exploit the ultimate usefulness of Employment Service office records for the purpose of developing training programs. This source is highly recommended for further study.

Numerous methods of securing occupational background information for in-migrants were investigated. Two of these methods might well be explored further. The Regional Planning Commission mandate from the Bureau of Public Roads to determine future transportation needs in the area, based on household sampling, might be broadened sufficiently to include occupational data. The other possible method might be to find some means of adapting change-of-address cards filed with the Post Office Department for this purpose.

With respect to supply determinants, PROJECT VISION concluded that Employment Service research, at the area labor market level, could best contribute to the development of improved data basic to vocational education program planning if it were to emphasize occupationally-oriented studies of labor turnover, in-plant training policies, institutional training preferences, lateral transfers, wage rates, and in-out migration. It became only too apparent that in the Milwaukee area at the time of the experimental effort little practical data were available on these aspects of labor supply.

## EXPERIENCED LABOR SUPPLY RESOURCES

In the preceding chapter, the concern was with the supply of workers for entry level occupations--young people coming into the Milwaukee area labor market with minimum skills from high schools or as graduates of technical training programs and schools. A second entirely distinct group of people are also in the labor supply pool. These workers, diverse in age and background, have in common one distinguishing attribute, namely, work experience. The type of experience they have had reflects, for the most part, the industrial characteristics of the Milwaukee SMSA. Exceptions to this generalization are those persons migrating into the area in search of work, some of whom may be equipped with skills not generally in demand. In addition, among returning veterns native to the Milwaukee area are many who have worked for the Armed Forces during their period of service, but who may not necessarily have acquired skills in good demand. It is these fluctuating, heterogeneous groups, so potentially valuable to employers seeking additional workers, that will be discussed in this chapter. Such experienced workers may or may not be employed.

The experienced unemployed workers seeking work may be broadly classified into the following four groups:

1. Returning veterans seeking jobs.
2. Unemployed local area persons seeking work, many of whom are registered with the WSES.
3. Returnees to the labor market, principally women homemakers.
4. Experienced in-migrants hoping to find employment in the Milwaukee area.

The employed workers usually belong to one of two classes. They may be

1. Employed workers transferring from one job to another, including those moving out of one occupation into another.

2. Employed workers receiving in-plant training in order to meet their employer's replacement needs.

The experienced unemployed workers will be discussed first.

## Experienced Unemployed Workers

### 1. Returning Veterans Seeking Work

In 1967 an area-wide program was started in order to aid returning servicemen in finding work in their community. While they will not all have had employment experience in business or industry, the large majority return with a foundation in service-connected work.

Information concerning the returning serviceman is available principally from two sources. At the separation center the serviceman completes a form on which he enters specific information regarding his service occupation as well as any work experience prior to entering the Armed Forces. In addition, the Veterans Administration representative, attached to the Milwaukee District Employment Service office under a contract program, contacts the veteran on his return to offer assistance in helping him find work. Veterans may also apply for unemployment compensation for ex-servicemen.

Together, these records provide valuable sources of occupational information on available workers returning to the community with marketable skills such as electronic technicians, reactor operators, etc. Although quite reliable, the records at the separation center are difficult to use and the information from them had not, at the time of writing, been incorporated to any extent into the labor market information system. Because retrieving the information would have been so time consuming, PROJECT VISION only appraised its availability and its potential value to an information system.

## 2. Unemployed Persons Registered for Work with the WSES

Thousands of people apply for work at the Milwaukee Employment Service Adult Office and the Youth Opportunity Center each year.[1] Their applications provide an important indicator of both experienced and inexperienced workers available in the community. However, in order to avoid double counting of young inexperienced new entrants to the labor market in any area-wide accounting of their total number, it is probably good practice not to count those who are registered with the Youth Center among the number estimated to be available to most employers' needs. For this purpose, their school or training program affiliation is the preferred port of entry.

Registrations at the Adult Office, in contrast to those at the Youth Opportunity Center, can be a valid source of information regarding the employment characteristics of unemployed workers. In Milwaukee, the Adult Office has for many years kept a monthly tally of active applicants by 3-digit and, in some cases, by 6-digit DOT codes. This has been an accounting undertaken by the District Office labor market analysts for their own information, which is over and above records required by State and national Employment Service procedures. The tally has proved to be valuable in evaluating one of the supply factors in the local labor market situation.

One of the important causes of adult worker registrations lies in the regulations respecting the receipt of unemployment compensation by covered workers who are temporarily unemployed. Such men and women must register with a public employment office and keep their applications active throughout any period of unemployment to qualify for the issuance of checks on their behalf. Other unemployed workers may or may not be registered with the WSES. Any effort undertaken to account for all unemployed workers making use of public and private employment offices must make allowances for such double counting as may arise from people registering at more than one agency.

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[1] The geographic jurisdiction of the Milwaukee District Office and the Youth Opportunity Center of the WSES is now (1970) Milwaukee, Ozaukee, and Washington Counties (Washington County was added after the field work on PROJECT VISION was completed).

### 3. Returnees to the Labor Market, Principally Women Homemakers

Although PROJECT VISION did not undertake to make a special study of a widely recognized source of experienced labor supply, namely, housewives desiring to return to work either on a part-time or full-time basis, it is important to call attention to this fluctuating but important labor pool for many employers. Evidence of its size was offered in Chapter III (p.28). It was stated there that approximately 33 percent of the Milwaukee SMSA nonfarm wage and salary labor force at the time of the survey were women. Also, studies made in other labor market areas testify to the acceptability of women returnees as employees. One such undertaking in the San Francisco Bay area in 1967 indicated that of 303 employers, 83 percent had "no marked reluctance to hire housewives with child care responsibilities."[2] Understandably employers expect that returning mothers would have made adequate arrangements for child care.

### 4. Experienced In-migrants to the Milwaukee SMSA

Those workers who move into a SMSA in a given period of time are one of the most difficult sources of labor supply to locate, measure, and classify occupationally. Necessary as it is to determine the net result of the in-out migration, it would be even more desirable if a determination could be made of the occupational experience of persons moving into the area.

Milwaukee's location in the State of Wisconsin has direct bearing on the character of the in-out migration pattern for the area. It will be recalled that the City of Milwaukee is the industrial vortex of the 4-county SMSA; that the three surrounding counties undoubtedly feed workers into the central urban area; that access to Illinois and the Chicago labor market area is so easy either by public transportation or motor highways that the northern limits of the Chicago area can be said to be within commuting distance.

PROJECT VISION investigated several sources of migration data in the Milwaukee area in the course of an examination into the feasibility of determining changes in labor supply by occupational classification that are due to net migration. It was found that it would be impractical to make estimates on migration by occupation from the data available to the Project at the time. The sources investigated are described below and are evaluated both in terms of the Project's expectations and their potential in the Milwaukee SMSA.

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[2] Margaret S. Gordon and Margaret Thal-Larsen, Employer Policies In a Changing Labor Market (Report of the San Francisco Bay Area Employer Policy Survey, 1967); Institute of Industrial Relations, University of California, Berkeley, July 1969, p. 311.

a. The Milwaukee Journal.--Periodically, the Journal has carried out consumer research surveys. These are household surveys, similar in intent to that of the U.S. Census Current Population Reports. Journal representatives were interviewed about their recent survey covering 3,000 households, during which individuals were classified according to their occupational endeavors and the industries in which they worked. They were also asked whether they had lived at their present address a year before the survey was taken, and whether they had moved to their present address from another county. It was hoped that the results of the survey could be used to determine the number of individuals working within a broad occupational classification who moved into the SMSA during any one year. The Journal staff agreed to tabulate moves into the area by occupation for 20 occupational groupings attempting to do this, they concluded that the results would be unreliable, since there were so few individuals within any one of the 20 occupational groups who had moved to Milwaukee from another county (either a county within the SMSA or outside of it). Therefore, little of significance could be determined as to the in-migration of individuals with a particular occupational background from this survey.

b. The Southeastern Wisconsin Regional Planning Commission.--This Planning Commission and others throughout the country have been given a mandate by the Bureau of Public Roads to study and determine the future transportation needs of their areas. As a result, many of the commissions have undertaken various studies on the social and economic characteristics of the individuals living within their areas, including studies on commuter patterns known as "origin and destination studies."

The Wisconsin Commission carried out a household study on the history of residents of the southeastern Wisconsin region which included information on mobility, or moves from other areas into the southeastern region. The commission tabulated the number of individuals who moved into the area for five separate years. (These were not consecutive years, but covered a span of 13 years in time.) These moves were not classified according to the occupational background of the individuals who moved. One of the members of the commission did believe, however, that it might be possible -- at least in the future -- to cross-tabulate data on moves with data on occupational backgrounds.

The study was based on probability sampling and included one out of every 31 households in Milwaukee County and in most of Ozaukee and Waukesha Counties. These three counties comprise about 85 percent of the families living in the Milwaukee SMSA. Since this sample is much larger than the one used in the Milwaukee _Journal_ survey, it is felt that meaningful and reliable information on moves by people working in specific occupations or occupational groupings could be determined by making use of this type of study.[3]

c. _The Local Post Office_.--Consideration was given to the possibility that the Post Office records might yield data on migration since it receives forwarding address information from individuals who move. PROJECT VISION staff members were informed by the postmasters of the cities of Milwaukee and Madison, Wisconsin, that records of moves of individuals into an area were rarely kept. Moves from an area were kept by the local Post Office district, but the data as a whole were not filed systematically and were not tabulated to give a total figure on out-migration for the area. Occupational characteristics of those who moved were hardly ever secured. In any event, it was assumed that the Postmaster General's office would have to approve the transmittal of any such data to other agencies.

It may be that in the future occupational data could be collected if the Post Office Department were persuaded to ask for the most recent occupational experience of individuals on their change-of-address cards. Individuals could also be asked to file a card with the Post Office for their new residence, stating the general area from which they moved and the broad occupational area within which they worked. Obviously, such an enterprise would be monumental. The benefits secured would have to be weighed against the cost and effort involved. Nevertheless, a pilot project undertaken in some relatively large metropolitan area might provide answers to the questions as to whether data on moves, collected from the Post Office system, could give reliable information on net migration by occupational grouping for local areas.

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[3] It might be pointed out that similar studies have been made in Minneapolis, Detroit, and Chicago. The Chicago area transport study group updated its original origin-and-destination study to include moves of individuals and commuter patterns for the years 1966-1967.

d. Department of Public Instruction.--Since one method of estimating net migration makes use of school enrollment figures, and since pupil registration forms do provide space for parents to enter their occupations, consideration was given to the possibility that these two factors might be employed to provide a source of migration data by occupation. On the basis of PROJECT VISION's investigation of this source, it was concluded that such an approach would not be feasible.

First of all, it was found that occupation information on pupils' parents is not collected systematically. The Department of Public Instruction does not request occupational data from school districts, and therefore the districts are not obligated to retrieve such information from individual school records. Under normal procedures, then, the data relating to occupations gets no further than the registration forms of individual pupils.

Secondly, even if occupational data were to be collected systematically from individual records, it would be of doubtful reliability, since the occupations are entered by parents themselves, and the designations are dependent on what each working parent happens to call himself. In addition, it is questionable whether overall changes in pupil enrollment from year to year can be linked to in-out migration of particular occupations without something approximating a family-by-family or record-by-record check. The schools are not equipped to do this; to permit an outside agency to do so would most likely raise questions as to what constitutes a "public record." Furthermore, boundaries of a school district or combination of districts are unlikely to coincide with boundaries of economic units such as the Milwaukee SMSA.

e. Wisconsin Telephone Co., Wisconsin Electric Power Co., Wisconsin Gas Company.--Inquiries were made of the telephone company and the electric and gas utilities to determine whether net migration statistics by occupation could be secured from their files.

> It was found that occupational information is only incidentally acquired, if at all. Further, it was pointed out that new and discontinued meter installations do not correlate with people; that is, the number of installations do not indicate the number of persons moving in our out. Installations may be in commercial establishments, with no one in residence, or in apartment buildings where a single meter may serve for several residents. A similar lack of correlation exists with telephone installations and numbers of persons. Therefore, the utilities' records offer little information on in-out migration of persons, and no real occupational information at all.

After the fairly exhaustive efforts described above, PROJECT VISION concluded that no organized interagency effort has been brought to bear on organizations in the Milwaukee SMSA to collect, retrieve, and disseminate migration data. The problem really is one of convincing public and private agencies of the value of the information they collect, and of the importance of their offering to coordinate the collection of data in order to make available information from various sources to complete a picture of in-out migration in a given community.

Sources of data on migration by occupation are so hard to come by that government funds might well be used to finance a pilot project to develop methods for using effectively such heterogeneous data as are available locally. Also, it is entirely possible that the U.S. Census of Population might be able to collect and tabulate migration data by occupation in some detail, in which case special tabulations for SMSA areas might be obtained on a special request basis if it were not routinely presented in this fashion by the Census. A precedent for this is found in the 1960 Census of Population with respect to place of work of persons 14 years of age and over living in the Milwaukee SMSA.[4] These data are presented by major occupation groups, by sex, and by place of residence within the SMSA, thereby revealing broad commuting patterns. The general content of this particular presentation offers a clue to a possible source for migration data by occupation that might be worth investigating.

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[4] U.S. Bureau of the Census, U.S. Census of Population: 1960, Detailed Characteristics, Wisconsin. Final Report P C(1)-51 D, "Families, Fertility, Migration, Employment, Income, Occupation, Industry, etc.," Table 131: Place of Work of Workers During Census Week by Selected Characteristics, for Standard Metropolitan Statistical Areas of 100,000 or More, p. 51-455.

Attention is now directed to that other, even larger, group of experienced workers -- those currently employed in the Milwaukee SMSA. This is by no means a static group. At any one time some employed workers are moving from job to job by means of lateral transfers and vertically up the job scale by means of upgrading within the plant in which they are employed. The lateral transfers will be discussed first.

## Experienced Employed Workers

### 1. Employed Workers Making Lateral Job Transfers

PROJECT VISION undertook an analysis of all placements made on job orders closed during August and September 1967 at the Milwaukee Youth Opportunity Center. The purpose of the analysis was to throw light on the extent to which Employment Office applicants had shifted from one occupational field to another. The resulting information was expected to indicate the extent to which vocational aptitude acquired from experience, vocational education courses, apprenticeship instructions, military service, or other specialized training courses is ultimately put into practice.

The majority of placements occurred among persons under 22 years of age because the study was based on the closed orders in the Youth Opportunity Center. Since the qualifications which most of these young applicants brought to a job were the results of training rather than experience, the study tended in the first instance to be an analysis of the utilization of training. Applicants with significant qualifying experience, however, comprised almost 40 percent of the placements so that to some degree actual lateral job transfers could also be analyzed.

A total of 323 placements was studied. A comparison was made of the probable job duties for which individuals were hired, as indicated by orders, with the background of the applicants as indicated on their application cards. Such placements were categorized according to two primary criteria:

> Those who had some significant qualifying work experience (127, or 39 percent) versus those persons placed who had no significant work experience (196, or 61 percent), and

> The types of jobs in which applicants were placed, grouped by basic skills and/or knowledge relevant to the job. The jobs were in turn grouped into four basic fields: commercial, service, manufacturing (those occupations directly involved with making something), and nonmanufacturing (jobs not involved with making things, but rather with such tasks as material handling, transporting or packaging). No significant numbers of placements in professional occupations were made during the period of study.

A total of 54 percent of persons placed accepted jobs directly in line with their training or experience; another 11 percent accepted jobs which were related to the occupations for which they had training or experience. Roughly 23 percent of the workers shifted to different occupational fields. The remaining placements (12 percent) involved applicants who had had no significant training or experience.

The overall percentage of job shifts (23 percent) is more meaningful when broken down between experienced workers (those who have had actual job experience)[5] and inexperienced workers (those whose primary qualifications consisted of school training). Of those who had had job experience, 43 percent shifted to an unrelated field, but only 8 percent of the inexperienced workers accepted work which did not utilize their school training.

No significant differences were found between placements made in commercial as compared with noncommercial occupations other than the fact that all applicants hired for commercial jobs had had at least some school preparation, while nearly 20 percent of those hired for noncommercial occupations had had no significant preparation for any job.

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[5] An indication of the extent to which men and women in the United States change jobs is offered in a nation-wide sample study by BLS published in 1967. The report states that of the men sampled, 84.9 percent had the same job in January 1966 as in January 1965, 9.3 percent had a different job, 5.8 percent were not working in January 1966. Men were said to have an occupational mobility rate of 9.9. Among the women sampled, 77.9 percent had the same job in January 1966 as in January 1965, 5.8 percent had a different job, 16.4 percent were not working. Women were judged to have an occupational mobility rate of 6.9. These data are also presented by major occupational group. Source: U.S. Department of Labor, Bureau of Labor Statistics, Special Labor Force Report No. 84, Occupational Mobility of Employed Workers 1967 (reprinted from Monthly Labor Review, June 1967).

Two types of shifts occurred with sufficient frequency to be indicative of a pattern of some significance:

> Commercially trained and/or experienced women applicants who shifted to factory jobs because of high factory pay rates (influenced by an order from a large manufacturing company); and
>
> Trained (special course under MDTA) and/or experienced nurse's aides who shifted to other fields to escape from low hospital pay scales ($1.25 to $1.35 per hour).

It should be remembered that this study covered only YOC applicants. Primarily, they are people who have employment-related problems or are dissatisfied with their first jobs (or fail to hold them) who apply for another job. Those who stay on their first job, of course, don't show up at an employment agency. Therefore, the character of job shifting among YOC applicants (23 percent) is not representative of the labor market as a whole. The findings are probably most valid when they pertain to recent school graduates and dropouts. However, a study of job shifts among such persons might better be made directly from applications rather than from closed job orders.

## 2. Employed Workers Receiving In-plant Training

It has already been shown in Chapter IV (pp. 64-67) that in most establishments in the Milwaukee SMSA at the time of the area Employer Needs Survey manpower planning was not an integrated part of their management procedures. How, then, did employers meet their need for workers in specific occupational slots? Among the techniques used in tight labor market areas, such as Milwaukee was in August 1967, were wage increases above the initial offer, lowering of occupational and educational standards, pirating from other employers in the area, importing skilled workers from outside the area, increased advertising, use of the Employment Service, restructuring the job, and in-plant training and upgrading of employees already on the payroll. "Labor shortage" in such situations turns out to be an imprecise term.

It is conjectured that one of the most constructive ways an employer can meet his needs is via the in-plant training route. PROJECT VISION was not able to undertake a comprehensive study of in-plant training and upgrading as they were programmed by Milwaukee employers at the time of the survey. However, it recognizes the important implications that they have for evaluating future vocational education planning in the community. An understanding of the "internal" labor market is so essential that it is recommended that "port-of-entry" jobs be more adequately investigated together with hiring practices and promotional procedures as they relate to training.

# CHAPTER XII

# VOCATIONAL EDUCATION INFORMATION NEEDS AND SYSTEM

## SUMMARY

PROJECT VISION's extensive and intensive efforts over a 2-year period of research to develop a meaningful communication with vocational education administrators on any one of several levels regarding their occupational information needs and the capability of the Employment Service to subsequently furnish pertinent data underline the need for sustained efforts along these lines. Granting that the two systems have a common purpose in working toward the effective placement of trained workers in appropriate jobs, and believing that sufficient mutual understanding and effort can result in improved opportunities for good job placements, PROJECT VISION offers a number of suggestions. These are outlined under CONCLUSIONS at the end of this chapter.

It is emphasized that, in cooperation, both systems should continue to strive for more realistic research and analysis of specific occupational needs and the avenues by which the public vocational educators might more satisfactorily meet them.

## RELATIONS BETWEEN EMPLOYMENT SERVICE AND VOCATIONAL EDUCATION AGENCY

The Vocational Education Act of 1963 and its subsequent amendments stipulate that the State Employment Service and the State Vocational Education Agency exchange information with the objective of making vocational training more relevant to the changing industrial demand for occupational skills. PROJECT VISION has concluded that there was a pronounced need for continuing effective groundwork to bring about more useful communication between the two systems. All the evidence pointed to the wide gap that existed between them because of the absence of a common or convertible technical language at the time PROJECT VISION was undertaken, and because the occupational information available to the Employment Service at that time was not sufficiently pertinent to the vocational educators' programming needs. There follows an examination of some of the more perplexing problems that faced the two disciplines which tended to hinder the fulfillment of the obligations placed on the Employment Service.

## Problems of Communication

PROJECT VISION during 1967 and 1968 conferred extensively with vocational educators at the national, State, and local levels in an effort to learn from them the types of labor market information they considered would be administratively useful to the vocational schools for the purpose of curriculum planning. It was hoped that on the basis of such knowledge the Employment Service could then prepare suitable basic data to meet expressed needs.

For the most part, efforts in this direction were judged by PROJECT VISION to be unsuccessful. It is believed that vocational education administrative units in the Milwaukee SMSA were not staffed with personnel sufficiently acquainted with labor market economics. Therefore, it was disappointing but understandable that the basis for a dialogue concerned with labor market problems was all but impossible to achieve.

It was even more disheartening when two vehicles for communication between the agencies in Wisconsin, outside PROJECT VISION, also failed to produce clarification of the basic needs of vocational educators for labor market information. Neither the State Employment Service Vocational Education Advisory Committee meetings nor the regional conferences for educators, attended by Employment Service labor market research staff members, were productive of fundamental statements of occupational information need.

Thus, in the Milwaukee area at the time of PROJECT VISION, effective execution of the directives of the Vocational Education Act of 1963 concerning information exchange was impeded at the first step -- that of defining the problem to be researched and analyzed. It is the opinion of PROJECT VISION that both systems or services in the area were in part responsible for this lack of achievement.

## Understanding the Reasons for the Communications Gap

In the Vocational Education Act of 1963, the United States Congress declared its purpose to assist States in making available to "persons of all ages in all communities" of the States vocational training or retraining "which is realistic in the light of actual or anticipated opportunities for gainful employment . . . ."[1]

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[1] Vocational Education Act of 1963, Part A, Subsection 1.

It was assumed by the Congress that the Employment Service was in a strategic position to assist vocational educators in reaching these goals. PROJECT VISION believes that the use educators could make of the data generated by the Employment Service was not given adequate consideration. Some of the problems relating to the use of Employment Service data by educators are among the subjects discussed below.

## The Relationship of the Time Factor in Occupational Requirement Estimates to Vocational Education Management Decisions

Vocational education administrators in their practice of planning for vocational education students, with their placement in industry as the immediate end in view, orient their approach in the first instance to one school year or at the most to a 2-year course period. Educators at both State and local operating levels stated that 90 percent of their decisions need not be based on labor market projections beyond two years. On the other hand, Employment Service labor market analysis has for the most part developed in the direction of long-range forecasting of industry and occupational trends, the base period generally being for two and five years in the future.

In Chapter IV, evidence was presented that employers were reluctant to make such long-range forecasts, believing that they could not evaluate the labor market dynamics so far ahead. They were found to prefer a 1-year period as the most realistic basis for estimating occupational requirements.

PROJECT VISION found that vocational educators in the Milwaukee SMSA leaned heavily toward this same approach. Consequently, it became apparent that local vocational school administrators did not see the Employment Service labor market information as having value in their making of management decisions regarding short-term operational plans. In the Milwaukee area local, not State or national, administrators make many of the decisions, particularly as far as their community is concerned, on the following matters: (1) Initiation of research for new vocational courses, and (2) determination of course expansion or reduction. Moreover, these decision makers often are not specifically concerned with long-range skill requirements (5 years plus), but are more appropriately concerned with supporting evidence on current skill needs and continuance of those needs for at least two years with some assurance that such a trend will continue. In other words, they give little credence to the idea of identifying skill needs in the far future that are not in evidence today. All too often educators have seen the training implications of new inventions turn out to be completely wrong. Predictions that tape-controlled machines would shortly replace vast numbers of machinists, or that computers would cause vast unemployment in the United States by making many skills obsolete, are cited as examples of misleading prognostications.

## Relationship of Vocational Education Graduates to Other Sources of New Entrants to the Labor Market

Public vocational schools provide the labor market with an unknown fraction of trained workers in many occupations. The administrators of these schools in the Milwaukee area at the time of PROJECT VISION's study did not know if other types of vocational schools were preferred by employers nor did they know the trend in output of graduates from the other training schools. Therefore, when studying supply-demand data from Employment Service skill surveys (data that in themselves do not always present a well-rounded picture), the educators still did not have before them certain information needed to make realistic management decisions. The effective planning of vocational education programs must take into account the many and varied sources of entrance to employment in specific occupations. In general these include promotion from within; on-the-job training; the varied occupational experience gained by returning servicemen while on active duty; job shifts; private vocational school training; and the occupational experience of in-migrant workers. During the latter half of the 1960 decade the restructuring of jobs for the disadvantaged worker became a new factor affecting the design of local training programs.

## Relationship of Employers' Estimates of Occupational Needs to Vocational Education Management Decisions

A certain rate of growth for an occupation predicted by local employers cannot be directly translated into a similar rate of increase in training requirements, since the number of trainees to be be programmed is dependent on a number of other factors which include technology, changing wage scales, job restructuring, etc. Some educators praised the Employment Service occupational requirement projections, but when pressed were hesitant to translate these stated figures into trainee requirements. There was a tendency on their part to think that the estimates of future growth were exaggerated. Therefore, statistics on anticipated increases in employment by occupation, such as the Area Skill Survey technique develops, must be presented by the Employment Service insofar as possible within the context of a fully developed presentation of the local labor market situation. If such a report takes into account seasonal, cyclical, and structural trends as supplied by the general reports and newsletters of the Employment Service and is oriented to the educators' planning needs, it can be expected that the arithmetical estimates will be more widely accepted.

It is the judgment of PROJECT VISION that educators at local levels would like labor market data that lead directly to a final answer to the question: How many graduates can be placed next June, avoiding either an over- or under-supply in the community? That Employment Service labor market analysts cannot answer this question with guarantees is obvious. There is no single labor market statistic that can concisely answer their questions on the specific responsibility of their school to train specific numbers of people at specific times. Direct statements by key local employers that they will hire graduates seemed to be the favored base for planning course expansion. It was, in the educators' mind, almost a commitment to hire, whereas Employment Service data lacked this personal employer-educator type of communication. As a result, important employers' known occupational requirements carried with them a weight of credibility that no Employment Service report possessed.

There is one additional aspect of this problem. The Employment Service, to maintain the confidentiality of its reports, describes merely a prospective employment change in the community as a whole. In contrast, local educators are placement oriented and thus concerned with actual people in actual courses. They worry about the placement of graduates with specific companies, in June and July after the academic year, with adequate wages and future promotional possibilities. PROJECT VISION suggests that Employment Service reports, when prepared with vocational educators' needs in mind, be as specific as possible regarding factors in the local labor market situations which have direct bearing on immediate labor demand.

## Relationship of Unemployment Data to Vocational Education Management Decisions

Statistics on the unemployment rate and periodic fluctuations in the work force are economic factors on which educators were found to place little reliance in the process of developing training programs. At the same time, Employment Service labor market analysts in the Milwaukee area have not distinguished between cyclical, structural, and seasonal unemployment problems sufficiently. If this aspect of the local labor market situation could be developed by the local Employment Service analysts, it could strengthen the material presented to the educators for their use in curriculum planning.

## Relationship of Job Vacancy Data to Vocational Education Management Decisions

Both unfilled job opening counts and job vacancy data available from Employment Service records, although indicators of present skill shortages, serve to raise the following questions:

> How many vacancies or job openings could be filled by recent vocational school graduates?
>
> Will the shortage (caused by a number of factors in addition to need for training graduates) continue for two or more years?
>
> Are the vacancy estimates by employers in some instances overestimates? In other words, will the employer be able financially to hire the number of persons indicated by vacancies?

Here again, educators said they were unable to make concrete decisions based on Employment Service statistics. However, PROJECT VISION suggests that in this area the Employment Service can at the very least pinpoint certain occupations toward which research attention might be directed by vocational educators.

### Relationship of Employment Service Reports to Vocational Education Management Decisions

Generally speaking, the Employment Service reports developed in the Milwaukee SMSA at the time PROJECT VISION research was conducted did not discuss the effect labor market changes would have on training needs and did not point-by-point build a credible case in a readable information package. Because of past habits and lack of training of Employment Service research staff units, the reports were simply not geared to the use of local vocational educators.[2] Employment Service labor market analysts in the area did not understand educators' needs, and, more important, did not understand how labor market changes affected training needs. Therefore, some of the reports appeared to be a pointless collection of tables and poor narrative with no specific objective in mind. Furthermore, in the Milwaukee area professional persons trained in editing were seldom found on the staff of the Employment Service.

## EMPLOYERS' RELATIONSHIP TO VOCATIONAL EDUCATION PROGRAM

Employers, whether they used the public vocational school or not, were not explicit in evaluating training needs in the community. During PROJECT VISION's personal interviews with 167 Milwaukee employers, few expressed a strong opinion on the value of vocational education -- either for or against. Even companies hiring a fairly large number of Milwaukee Technical College graduates had few suggestions. It was surprising, also, to find that employers with expansion plans, surveyed by mail, rated the vocational school system very low as a source of labor to meet their expanded work forces. In some instances, at the time of the survey employers did not recognize the training source of people hired but merely took their skills for granted. More recently, employers concerned with training have contributed their knowledge and advice as industry representatives on the MDTA Advisory Committees.

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[2] Subsequent to the period in which PROJECT VISION did its research, the United States Training and Employment Service has designed special purpose reports for vocational education program planning needs. Also, Employment Service reporting currently places more emphasis on occupational trends than in the past.

## NEED FOR OVERALL SUPPLY INFORMATION IN THE MILWAUKEE SMSA

There was little supply data available in the Milwaukee SMSA, and such as it was was not very useful to local vocational educators. For example, there were no annual enrollment figures by curriculum for the private vocational schools in the Nation, State or community. Information on employer training preferences in terms of types desired -- on-the-job training, institutional vocational training, or technical level preparation -- was found to be badly needed.

Comprehensive data on enrollment and graduates year-by-year for all training institutions in a labor market area by curriculum title and total hours of instruction are very essential but were missing. With such data, educators and others working in the area of manpower planning could better determine the extent and character of institutional contributions to the labor supply on an annual basis. It might be collected at the area level by the U.S. Office of Education from all institutions as it now collects data from the Wisconsin State Board of Vocational, Technical, and Adult Education. In addition, it would be desirable for public vocational schools to obtain accurate follow-up data for their graduates such as company hiring, location, wage and occupation. Its value would be enhanced if it could be recorded on computer tape for comparison with various types of data available from Employment Service records and reports.

## CONCLUSIONS

Local vocational educators, crucial decision-makers in vocational training programming in the Milwaukee SMSA, vitally need current and short-term economic data upon which to judge present success and develop projections of curriculum needs. It would assist them in gaining a clear understanding of the present labor market which is essential to their evaluation of specific courses and to placing considered modifications in their proper context. Accurate data on school enrollment and the degree to which graduates are successful in obtaining satisfactory jobs should be collected by educators in a form designed to aid future program planning.

The Employment Service, if it is to be an aid to educators, must look at the problem creatively. Perhaps as a step toward providing data of greater immediate concern to vocational educators, it might try to develop an employer survey which emphasizes sources of training for persons recently hired (as suggested in AREA EMPLOYMENT BENCHMARK SURVEY: A NEW APPROACH, at the end of Chapter IV).

In SMSA's the size of Milwaukee, data on specific employers must be stored and retrieved for comparison with other employment records. This would require the computerization of the information system.

PROJECT VISION's findings indicate that when local educators in the Milwaukee area described the kind of information they wanted, they did not stress long-range occupational forecasts as manpower economists have tended to do. Perhaps they expressed their needs more realistically than did the theoreticians. Thus, in conferences with PROJECT VISION's staff members the educators generally indicated mild interest in the kinds of data the Employment Service had to offer. Subsequently their real interest was expressed in terms of the following questions:

> What is an employer's hiring preference regarding types of training today and in the future?
>
> How much of the demand expressed by employers should be filled by vocational school graduates?
>
> If an employer expresses a need for 100 xyz operators, how many is he actually budgeted to hire?
>
> How much of the demand is for port-of-entry type openings, and therefore a market for graduates of vocational schools?
>
> How much training does the employer do, and how does it compare in quality and purpose with the training provided by vocational schools?
>
> How does the employer feel about the caliber of graduates of the vocational school with regard to aptitude, attitudes, etc.?

The emphasis was consistently on the present. To these questions the Employment Service could say little. Yet they point to areas of concern that are obviously important for training policy determinations. It is toward meeting this type of informational need that many of PROJECT VISION's suggestions are directed.

# CHAPTER XIII

# TOWARD A COMMON OCCUPATIONAL LANGUAGE

## SCOPE

At the time the Vocational Education Act of 1963[1] was passed, there was no established means by which the U.S. Employment Service could conduct an "occupational dialogue" with the vocational education school system in order to carry out its mandate to provide those agencies with job market information. PROJECT VISION assisted in a major research project in this connection, in cooperation with the U.S. Office of Education and the U.S. Training and Employment Service, that contributed to the development of an occupational clustering system following the Office of Education instructional outline. This cross-classification, which relates occupations to educational subject matter, was developed to serve two purposes:

1. To arrange occupations into groups which can be used to classify occupational data and serve as a means of interpreting and presenting such data to educational systems, industry, and trade associations, and to identify areas for occupational training in our economy.
2. To be used by the Office of Education to indicate the range of occupations which each of their training programs will qualify a trainee to enter.

The basic principle behind the development of this job-clustering system is the grouping of occupations for which a given instructional program will prepare an individual for entry. Such an arrangement results in occupational groups based upon areas of worker knowledge critical to satisfactory performance of the tasks involved. The results were formalized in an Occupational Cluster Reference Guide.[2]

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[1] Vocational Education Act of 1963, sec. 5(a)(4).

[2] The Occupational Cluster Reference Guide contributed to the subsequent publication of bulletin Vocational Education and Occupations (GPO, 1969), by the Office of Education, U.S. Department of Health, Education, and Welfare, and the Manpower Administration of the U.S. Department of Labor. Additional clarification of the thinking that preceded the preparation of the manual is presented in an excerpt from the introduction to the manual in Appendix J (pp. J2 and J3).

## METHODOLOGY

The Dictionary of Occupational Titles (DOT) was used as the primary source of occupations and occupational groups[3] because the individual DOT definitions lend themselves to classification by knowledge applied, since they have been written to reflect skills, knowledge, and abilities involved in the occupations.

Whenever possible, DOT occupational groups were used. Each group was read and analyzed to determine whether it was primarily based upon an area of worker knowledge; that is, whether the occupations listed within the group were homogeneous to the extent that they were based on the same knowledge requirements. Wherever this was the case, the group titles from the Occupational Group Arrangement (OGA) were classified and listed under the instructional program which prepared students for occupations in the group.

Many occupational groups in the DOT are based upon criteria other than knowledge requirements, or are merely a grouping of miscellaneous occupations not classified under existing groups. In these groups, each individual occupational definition was read and classified into the instructional program job cluster to which it applied.

In the Guide, the Office of Education instructional programs are presented in outline form. DOT groups and definitions are listed under the most specialized echelon in this outline with which they could be accurately identified. For example, a Construction Equipment Mechanic, 620.281, is quite specialized in knowledge applied, and therefore classifiable under Maintenance, Heavy Equipment 17.10,03.01. On the other hand, a House Builder, 869.281, employs so wide a variety of construction trade knowledge that he cannot properly be listed under any of the specific construction trades. Therefore, this occupation must be listed in the more general category, Construction and Maintenance Trades, 17.10.

Some groups or families of occupations are based upon a body of knowledge not currently covered by an instructional program. These groups are listed separately under the appropriate "Other Occupations" code ".99" headings provided in the Office of Education structure for such areas of knowledge and potential additions to existing programs.

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[3] "Groups" refers to the 3-digit titles in the Occupational Group Arrangement (OGA) in Vol. II of the DOT. Individual occupations are identified by 6-digit occupational titles in the DOT.

Wherever an occupation or OGA might be a possible occupational objective of more than one instructional program or subject matter area, it is listed under the one which appeared to be the closest match. If there appeared to be a very close relationship of occupational objectives to more than one instructional program, a cross-reference note is entered under each subject matter description.

Occupations listed are those which usually do not require a baccalaureate degree. In a few cases, occupations which usually require a degree for entry, but which sometimes are engaged in by persons without a degree, are listed with a notation to this effect.

With few exceptions, occupations which do not require significant occupational training (that is, those which are primarily routine or manual in character such as 886 and 887 in DOT Worker Trait Arrangement) are not listed under any of the instructional programs. The exceptions occur in instances when the industry makes a practice of listing entry tradesmen at the beginning level in order to give them further practical training to prepare them for advancement into their trade. For example, some helpers in construction trades (specified under 17.10, Construction and Maintenance Trades) are listed because many of these tradesmen start as helpers in geographical areas where a trade apprenticeship program does not exist.

No attempt was made to classify every title and definition in the DOT. Only base titles were used except in those cases in which related titles covered a specialization defined by the Office of Education.

In all cases, the DOT titles and definitions which covered the broadest application of a given occupation were used. To include many duplicating titles, which cover only limited applications of the occupation, would not have served a useful purpose.

## RESULTS

To increase the Cluster Guide's usefulness to local vocational schools, a staff member of PROJECT VISION developed a conversion of HEW codes to course codes of the various departments of Milwaukee Technical College (Adult-Vocational, Apprentice Programs, etc.). This material, found in Appendix J, demonstrates how vocational schools can convert HEW program listings into their own vocational course listings. This effort was well received by the Milwaukee vocational system, and has been applied to projects under way in the Research and Statistics Division of the Wisconsin State Employment Service. Through application of this technique, and use of the Cluster Guide, it is possible to convert occupational information directly to an individual school's courses.

To illustrate how this was done, the remainder of this chapter is devoted to reproductions of sample pages from the Cluster Guide and the conversion tables, using Dental Services (Health Occupations Education) as an example. The sample pages are arranged in the following order, with references to Dental Services occupations checked on each page:

1. Occupational Cluster Reference Guide: conversion of HEW instructional program to DOT codes and titles (p. 239).

2. Supplementary conversion table: DOT to HEW (covering contents of Cluster Guide) (p. 240).

3. Conversion table: HEW to Milwaukee Vocational and Technical College courses (p. 241).

4. Conversion table: Milwaukee courses to HEW (p. 242).

# INSTRUCTIONAL PROGRAM AND OCCUPATIONS

| U.S. OFFICE OF EDUCATION CLASSIFICATION | | DICTIONARY OF OCCUPATIONAL TITLES | | | |
|---|---|---|---|---|---|
| | | | | Worker Trait Groups (Vol. II) | |
| Code | Instructional program | Code | Occupational Title (Vol. I) | Page | Title |
| 07.01 | DENTAL<br>Included in this category are occupations concerned with supportive services to the dental profession. | | | | |
| 07.0101 | DENTAL ASSISTING<br>A combination of subject matter and experiences designed to prepare a person to assist the dentist at the chairside in the dental operatory, to perform reception and clerical functions, and to carry out selected dental laboratory work. | 079.378-010 | DENTAL ASSISTANT (medical ser.) | 477 | Nursing, X-Ray, & Rel. Ser. |
| 07.0102 | DENTAL HYGIENE (ASSOCIATE DEGREE)<br>A combination of subject matter and experiences designed to prepare a person to provide services to patients, such as performing complete oral prophylaxis, applying medication, and providing dental health education services, both for chairside patients and in community health programs, under the supervision of the dentist. (Included, as 16.0301 DENTAL HYGIENE, ASSOCIATE DEGREE, under TECHNICAL EDUCATION.) | 078.368-014 | DENTAL HYGIENIST (medical ser.) | 477 | " " " " " |
| 07.0103 | DENTAL LABORATORY TECHNOLOGY<br>A combination of subject matter and experiences designed to prepare a person to execute the work in producting restorative appliances required for the oral health of the patient as authorized by the dentist. | 712.281-010 | DENTAL CERAMIST (medical ser.) | 312 | Crafts & Rel. Wk. |
| | | 712.381-010 | CONTOUR WIRE SPECIALIST, DENTURE (medical ser.) | 312 | " " " " |
| | | 712.381-014 | DENTAL-LABORATORY TECHNICIAN (medical ser.) | 312 | " " " " |
| | | 712.781-022 | ORTHODONTIC GOLD-BAND MAKER (medical ser.) | 319 | Precision Wk. |
| | | 712.381-034 | MOLDER, BENCH (dental equip.) | 312 | Crafts & Rel. Wk. |
| | | 712.381-042 | SET-UP MAN, DENTURE (medical ser.) | 312 | " " " " |
| 07.0199 | DENTAL, OTHER<br>Include here other organized subject matter and experiences emphasized in occupations, not listed above, which are concerned with supportive services to the dental profession. (Specify) | | | | |
| 07.02 | MEDICAL LABORATORY TECHNOLOGY<br>Planned subject matter and laboratory experiences concerned with bacteriological, biological, and chemical tests to provide data for use in diagnosis and treatment of diseases--using microscopes, micrometers, and other instruments. Persons prepared in this area usually work under | | | | |

## INSTRUCTIONAL PROGRAMS AND OCCUPATIONS

## OCCUPATIONS RELATED TO INSTRUCTIONAL PROGRAMS

| DICTIONARY OF OCCUPATIONAL TITLES | | U.S. OFFICE OF EDUCATION | |
|---|---|---|---|
| Code | Occupational Title | Code | Instructional Program |
| 078.368-014 | DENTAL HYGIENIST (Med. Ser.) | 07.0102 | DENTAL HYGIENE (Associate Degree) |
| 078.378-010 | DENTAL ASSISTANT (Med. Ser.) | 07.0101 | DENTAL ASSISTING |
| 712.281-010 | DENTAL CERAMIST (Med. Ser.) | 07.0103 | DENTAL LABORATORY TECHNOLOGY |
| 712.381-010 | CONTOUR WIRE SPECIALIST Denture (Med. Ser.) | 07.0103 | DENTAL LABORATORY TECHNOLOGY |
| 712.381-014 | DENTAL LABORATORY TECHNICIAN (Med. Ser.) | 07.0103 | DENTAL LABORATORY TECHNOLOGY |
| 712.381-034 | MOLDER, BENCH (Dental Equip.) | 07.0103 | DENTAL LABORATORY TECHNOLOGY |
| 712.381-042 | SET-UP MAN,DENTURE (Med. Ser.) | 07.0103 | DENTAL LABORATORY TECHNOLOGY |
| 712.781-022 | ORTHODONTIC GOLD-BAND MAKER (Med. Ser.) | 07.0103 | DENTAL LABORATORY TECHNOLOGY |

TABLE I

# HEW INSTRUCTIONAL PROGRAMS[1]
# AS COMPARED TO
# MILWAUKEE TECHNICAL COLLEGE COURSES

| HEW Instructional Program | | Milwaukee Departments | | | |
|---|---|---|---|---|---|
| Code | Title | Course Number | Course Title | Manual[2] | Pages[3] Number |
| 01 | AGRICULTURE OCCUPATIONS | - | - | - | - |
| 04 | DISTRIBUTIVE EDUCATION | | | | |
| 04.01 | Distributive Education Instructional Program | (1)1-02:1 | Business Administration | T | 32 |
| | | (1)1-02:2 | General Business | T | 35 |
| 04.01.04 | Finance and Credit | (1)1-02:3 | Finance | T | 32 |
| | | (3)1-05:1 | Financial Clerk | V | 46 |
| 04.01.13 | Management (General) | (1)1-02:4 | Management | T | 33 |
| 04.01.14 | Marketing (General) | (1)1-04:1 | Marketing | T | 44 |
| | | (1)1-04:2 | Marketing Administration | T | 44 |
| 04.01.16 | Real Estate | (1)1-02:5 | Real Estate | T | 34 |
| 04.01.17 | Retail Trade (General) | (1)1-04:3 | Retail Administration | T | 44 |
| | | (3)1-04:1 | Retail Store Training | V | 41 |
| 04.01.99 | Service Marketing - Under other Instructional Programs | (3)1-04:3 | Service Marketing | V | 41 |
| 04.06 | Operations | | | | |
| 04.06.03 | Transportation | (1)1-04:4 | Transportation and Traffic Management | T | 45 |
| 04.10 | Allied Subject Matter | | | | |
| 04.10.99 | No Classified Program Listed Under "Other Allied Subject Matter" | (1)7-01:1 | Telecasting | T | 183 |
| 07 | HEALTH OCCUPATIONS | | | | |
| 07.01 | Dental Service | | | | |
| 07.01.01 | Dental Assistant | (1)5-08:1 | Dental Assistant | T | 97 |
| 07.01.03 | Dental Laboratory Technician | (1)5-08:2 | Dental Laboratory Technician | T | 100 |
| 07.02 | Medical Services | (1)5-09:1 | Medical Assistant | T | 104 |
| 07.02.04 | Nurse | (1)5-10:2 | Professional Nursing (Affiliated Hospital Schools) | T | 109 |
| | | (1)5-10:3 | Professional Nursing (Associate Degree) | T | 108 |
| 07.02.05 | Nurse's Aide | (3)5-10 | Nursing (no formal program) | V | 289 |

[1] Only when there is a relationship are the HEW Instructional Programs listed.

[2] T - Technical and Junior College Division manual. V - Adult-Vocational, Apprentice and Adult High School Div. manual.

[3] The page numbers refer to T - (1967-69 Edition) and V - (1968-70 Edition)

## MILWAUKEE TECHNICAL COLLEGE
## INSTRUCTIONAL PROGRAMS AS COMPARED TO HEW INSTRUCTIONAL PROGRAM OUTLINE

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1967-1969 EDITION PAGE # | CODE | TITLE |
| (1)2-04:1 | Printing and Publishing | 72 | 17.19* | Graphic Arts, Technical and Managerial Occupations |
| (1)2-04:2 | Operations Major | 72 | 17.19* | Technical and Managerial Occupations under Graphic Arts (Applies to Technical occupations listed) |
| (1)2-04:3 | Administration Major | 72 | 17.19* | Technical and Managerial Occupations under Graphic Arts (Applies to Managerial Occupations listed) |
| (1)5-03:1 | Fire Technology | 80 | 17.28.01 | Fireman Training |
| (1)5-04:1 | Police Science Technology | 83 | 17.28.02 | Law Enforcement Training |
| (1)5-11:1 | Restaurant and Hotel Cookery | 87 | 17.29 | Quantity Food Occupations |
| (1)5-11:2 | Commercial Food Preparation | 87 | 17.29.02 | Cook/Chef |
| (1)5-11:3 | Pastry Chef | 88 | 17.29.01 | Baker |
| (1)5-08:1 | Dental Assistant | 97 | 07.01.01 | Dental Assistant |
| (1)5-07:1 | Dental Laboratory Technology | 100 | 07.01.03 | Dental Laboratory Technician |
| (1)5-09:1 | Medical Assistant | 104 | 07.02 | Medical Services |
| (1)5-10 | Nursing | 106 | Not Coded | Nursing |
| (1)5-10:1 | Practical Nursing (Affiliated Hospital Schools) | 107 | 07.02.06 | Practical (Vocational) Nurse |
| (1)5-10:2 | Professional Nursing | 109 | 07.02.04 | Nurse |
| (1)5-10:3 | Professional Nursing (Assoc. Degree) | 108 | 07.02.04 | Nurse |

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Manpower Development and Training Act of 1962, Public Law 415, 87th Cong., 1962.

### U.S. BUREAU OF THE BUDGET

Standard Industrial Classification Manual (GPO, 1967 ed.)

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# APPENDIX A

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**APPENDIX A**

## GENERAL LIST

Administrative Occupations

- Accountant
- Accountant, Junior
- Marketing Administration Occupations
- Production Manager
- Purchasing Agent
- Traffic Manager

Engineering Occupations

- Chemical Engineer
- Chemist
- Chemical Laboratory Technician

- Civil Engineer
- Draftsman, Structural

- Electrical Engineer
- Electrical Technician (include Electric-Laboratory Technician)
- Electronic Technician
- Instrumentation Technician
- Draftsman, Electrical

- Industrial Engineer
- Tool Designer
- Engineering Assistant (include Mechanical Design Technician)
- Mechanical Engineering Technician (Experimental Technician)
- Part Programer, N/C
- Draftsman, Mechanical
- Detailer

- Foundry Metallurgist
- Metallurgical-Laboratory Assistant

Sales Occupations

- Manufacturer's Representative
- Salesman
- Sales Clerk

## GENERAL LIST (Cont.)

### Data Processing Occupations

Programer, Business
Programer, Scientific
Systems Analyst
Card-Tape-Converter Operator
Computer-Peripheral-Equipment Operator
Console Operator
Key-Punch Operator
Tabulating-Machine Operator

### Medical Service Occupations

Nurse, Registered
Dental Assistant
Dental Laboratory Technician
Medical Laboratory Technician
Nurse's Aide/Orderly
Nurse, Practical
Radiological Technician
Surgical Technician

### Clerical Occupations

Bookkeeper
Bookkeeping Machine Operator
Clerk, General Office (activities utilizing a knowledge of systems or procedures)
Clerk, General (entry or routine office occupations)
Duplicating Machine Operator (include Photocopy Machine Oper.)
Stenographer/Secretary
Stock Clerk (include Shipping and Receiving Clerks)
Typist

# CONSTRUCTION OCCUPATIONS

- Boilermaker
- Bricklayer (mason)
- Cabinetmaker/Millman
- Carpenter
- Cement Finisher
- Electrician
- Floor Layer
  - Carpet and Soft Tile
  - Hard Tile and Terrazzo
- Glazier
- Heavy Equipment Mechanic
- Millwright
- Operating Engineer
- Painter
- Plasterer
- Plumber (include Pipe Fitter)
- Roofer
- Sheet Metal Worker
- Stationary Engineer
- Steam Fitter
- Structural Steel Worker
- Truck Driver
- Welder
  - Arc Welder
    - Conventional Arc
    - Gas-Shielded Arc (include $CO_2$ and Heliarc)
    - Submerged Arc
  - Gas Welder
  - Combination Welder (Gas and Arc)
  - Welder-Fitter and Fit-up Man

**APPENDIX A**

## MANUFACTURING OCCUPATIONS

### Fabricating Occupations

- Punch-Press Die Setting and Set-Up Operators
- Press Brake Set-Up Men and Set-Up Operators
- Lay-out Men and Template Makers
- Metal Fabricators
  - Sheet Metal
  - Heavy Plate and Structural

### Forging Occupations

- Drop Forge Operator
- Hammersmith and Forgeman

### Foundry Occupations

- Bench and Floor Molders
- Machine Molder
- Coremaker, Skilled

### Machine Shop Occupations

- Grinders, Internal/External
- Tool, Die, Metal Pattern and Model Makers
- Machinist (Set-Up and Operate variety of Machine Tools)
- Machine Tool Set-Up Men and Set-Up Operators
  - Engine Lathe
  - Turret Lathe
  - Automatic Screw Machine
  - Radial Drill Press
  - Milling Machine
  - Planer and Shaper
  - Vertical Turret Lathe and Boring Mill
- Numerical Control (tape control) Machine Tool Operator
- Numerical Control (tape control) Machine Tool Setter
- Machine Tool Operators (no set-up)

### Welding Occupations

- Arc Welders
  - Conventional Arc
  - Gas Shielded Arc (include $CO_2$ and Heliarc)
  - Submerged Arc
- Gas Welder
- Combination Welders (gas and arc)
- Welder-Fitters and Fit-Up Men

## MANUFACTURING OCCUPATIONS (Cont.)

### Other Metal Trades

Metal Finisher
Heat Treater
Plater
Engraver

### Instrumentation Occupations

Instrument Repairmen and Prototype Assemblers
  Mechanical
  Electrical

### Optical Goods Trades

Opticians/Lens Grinders

### Plastics and Rubber Occupations

Plastic and Rubber Molding and Extruding Machine Set-Up Oper.

### Processing Occupations

Blenders, Compounders, and Ingredient Mixers

### Textile and Garment Occupations

Cloth Cutter (knife and die cutters)
Sewing Machine Operator

### Woodworking Occupations

Woodworking Machine Operators and Millmen
Pattern Makers, Wood

### Maintenance and Repair Trades

Industrial Machinery Maintenance Mechanic (All-Around)
Industrial Maintenance Electrician
Electric Motor, Generator and Transformer Repairman
Stationary Engineers/Firemen (Include related Powerhouse Trades)

## TRANSPORTATION, COMMUNICATION & UTILITIES OCCUP.

### Vehicle Mechanics

- Aircraft Mechanic
- Aircraft Frame Mechanic
- Automotive Mechanics (include Bus, Truck Mechanics)
- Automotive Body Builders and Repairmen
- Carmen, R.R.
- Locomotive and Diesel Repairmen

### General Maintenance and Repair Trades

- Appliance Serviceman
- Electrician, Industrial
- Electric Motor, Generator and Transformer Repairmen
- Heavy Equipment Repairman
- Instrument Repairmen (Mechanical)
- Instrument Repairmen (Electrical & Electronic)
- Pipe Fitters and Plumbers
- Steam Fitter
- Welder

### Operatives

- Bus and Truck Drivers
- Material Handling Equipment Operators
- Pump and Compressor Operators
- Stationary Engineer/Firemen (include related Powerhouse Trades)

### Specialized Clerical

- Traffic, Rate, and Transportation Clerks
- Warehouse Clerk

## RETAIL AND WHOLESALE TRADE OCCUPATIONS

### Maintenance and Repair Occupations

Appliance Serviceman (Gas)
Appliance Serviceman (Electrical)
Automotive Mechanic (include Bus and Truck Mechanic)
Automotive Body Repairman
Building Maintenance Mechanic (All-Around)
Radio and Television Serviceman

### Food Trades

Baker
Cook/Chef
Meat Cutters and Butchers
Waiter/Waitress

### Personal and Customer Service Occupations

Floor Layer, Carpet and Soft Tile
Jewelry Repairman
Tailor/Alteration Woman
Upholsterer

### Marketing and Merchandising Occupations

Manager, Retail Store or Department
Buyer, Store
Check-Out/Cashier

## SERVICE OCCUPATIONS

### Fabric and Garment Cleaning and Repairing Occupations

Machine Presser, Garment
Presser, Hand
Seamstress/Mender/Alterer/Tailor
Shoe Repairman
Upholsterer

### Maintenance and Repair Occupations

Appliance Serviceman (Gas)
Appliance Serviceman (Electric)
Automotive Mechanic (Include Truck Mechanic)
Automotive Body Repairman
Building Maintenance Man (All-Around)
Instrument Repairman/Watch Repairman
Machinery Maintenance Mechanic

### Personal Service Occupations

Barber
Beautician

### Cleaning and Custodial Service Occupations

Janitors/Caretakers

### Commercial Arts Occupations

Commercial Artist
Photographer, Commercial

## FINANCE, INSURANCE, AND REAL ESTATE OCCUPATIONS

Appraiser, Real Estate
Cashier
Credit Manager/Credit Trainee
Underwriter
    Health
    Life and Casualty

**APPENDIX A**

# PRINTING AND PUBLISHING INDUSTRY OCCUPATIONS

## Publishing Occupations

- Publisher
- Editor
- Reporter
- Feature Writer
- Technical Writer
- Commercial Artist
- Circulation Manager
- Advertising Lay-Out
- Printing Engineer
- Printing Estimator

## Printing Occupations

- Composing Room
    - Compositor
    - Lay-Out Man
    - Linotype Operator
    - Mototype Operator
    - Photo Composing Machine Operator
    - **Keyboard Unit Operator**
    - **Imposition and Lockup Man**
    - **Proof Reader**
    - **Proofer**
- Press Occupations (Lithography, Letterpress, Gravure, Silkscreen)
    - Job Printer, All-Around
    - Press Operators
        - Cylinder Press Operator
        - Platen Press Operator
        - Rotary Press Operator
    - Silk Screen Artist
    - Silk Screen Pressman
    - Silk Screen Helpers and Feeders
    - Print Shop Maintenance Mechanic
    - Proofer
- Platemaking Occupations
    - Artists and Touch Up Men
        - Dot Edge Artist
        - Process Artist
    - Photo Engraver
    - Cameraman
    - Platemaker
    - Stripper
    - Etcher
    - Engraver
    - Electrotyper
    - Stereotyper

## Bindery Occupations

- Bookbinder
- Machine Set-Up Operators (include Folders & Cutters)
- Bindery Workers
- Maintenance Mechanic

APPENDIX A

Following a suggestion of vocational educators, the project staff arranged the following groupings to reflect a kind of "hierarchy" of professional and supportive technical occupations:

Engineering Occupations

Chemical Engineer
Chemist
Chemical Laboratory Technician

Civil Engineer
Draftsman, Structural

Electrical Engineer
Electrical Technician
Electronic Technician
Instrumentation Technician
Draftsman, Electrical

Industrial Engineer
Production Planner
Methods Analyst
Industrial Engineering Technician

Mechanical Engineer
Tool Designer
Part Programer, N/C
Engineering Assistant
Mechanical Engineering Technician
Draftsman, Mechanical

Foundry Metallurgist
Metallurgical-laboratory Assistant

Data Processing Occupations

Programer, Business
Programer, Scientific
Systems Analyst
Card-Tape-Converter Operator
Console Operator
Key-Punch Operator
Tabulating-Machine Operator

Health Occupations

Nurse, Registered
Practical Nurse
Medical Technologist
Medical Laboratory Assistant
Nurse's Aide/Orderly

## APPENDIX A

The following lists represent suggestions made by various employers which were incorporated into the listing of occupational titles on the survey questionnaires:

Additions

- Accountant, Junior
- Traffic Manager
- Draftsman, Structural
- Metallurgical Technician
- Foundry Metallurgist
- Clerk, General Office
- Clerk, General
- Part, Programer (N/C)
- Grinders, Internal/External
- Numerical Control Machine Tool Setter
- Cashier (add to Finance, etc.)
- Credit Manager or Trainee
- Proofer
- Silk Screen Artist
- Dot Edge Artist
- Process Artist
- Underwriter
  - Casualty and Life
  - Health

Deletions

- Sales Manager
- Office Manager
- Draftsman, Architectural
- Laboratory Tester
- Quality Control Technician
- Tracer
- Cashier (from General list)
- General Office Clerk
- Loan Officer
- Claims Adjuster
- Investigator
- Silk Screen Maker

Definitions were written for the following titles in an attempt to avoid misinterpretation by employers:

Clerk, General Office
Clerk, General
Machinist

Changes were made in listing the following titles:

Secretary )-- On the questionnaires, these were combined
Stenographer ) and were listed as Stenographer/Secretary.

Stationary Engineer -- This was enlarged on the questionnaires,
and was listed as Stationary Engineer/Fireman
(Including related Powerhouse Trades)

## APPENDIX B

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  Instructions and Sample Page, Form 23 B- 9

## APPENDIX B

STATE OF WISCONSIN
INDUSTRIAL COMMISSION

WISCONSIN STATE EMPLOYMENT SERVICE
P. O. Box 1607
Madison, Wisconsin 53701

August 11, 1967

To Milwaukee area employers:

Do you know where you are going to obtain skilled workers in the next five years?

This same uncertainty also confronts hundreds of other local employers who must accurately chart their future plans.

In order to help executives facing this problem, a special study of manpower needs in the Milwaukee area is being undertaken as a joint enterprise by the Wisconsin State Employment Service and the Metropolitan Milwaukee Association of Commerce.

The study will obtain information not only from employers on their future manpower needs, but also information from training institutions regarding plans to expand their facilities and resources. If it is discovered that such future training capacity is not adequate, additional programs to make up any deficiencies can then be initiated.

Results of the study will be available to you.

Please complete the enclosed questionnaire and return it by August 18 in the envelope provided. Information pertaining to your individual establishment will not be published in identifiable form.

We are confident that this manpower analysis will provide your company and other Milwaukee industrial and commercial firms with a meaningful planning tool.

Your co-operation will help assure the value and effectiveness of this study project.

Sincerely,

Area Manpower Director

STATE OF WISCONSIN
INDUSTRIAL COMMISSION
TELEPHONE 266-3100 AREA CODE 608

WISCONSIN STATE EMPLOYMENT SERVICE
MAILING ADDRESS: P.O. BOX 1607 ZIP 53701
OFFICES: 4802 SHEBOYGAN AVENUE
MADISON, WISCONSIN

August 31, 1967

To Milwaukee area employers:

A letter and a questionnaire requesting urgently needed information was mailed to 1,200 Greater Milwaukee Employers three weeks ago. You may not have received the letter I sent to you, or pressing business activities may have delayed your response. However, a few moments of your time is vital to this study.

In order to meet the demands for skilled personnel during the next few years we need to know what the professional, technical, clerical and skilled manpower requirements will be. This information is the basis for planning educational and training programs. As an employer, this information will be useful in recruiting and planning for training programs.

Please complete the enclosed questionnaire and return it in the postage paid envelope provided. Information pertaining to your individual establishment will not be published in identifiable form.

Your co-operation will help assure the value and effectiveness of this study.

Sincerely,

Willett S. Main

W. S. Main
Area Director

APPENDIX B

WISCONSIN STATE EMPLOYMENT SERVICE
Manpower Needs Study
Milwaukee, Ozaukee, Washington and Waukesha Counties

Part I

To

Person Preparing Report ________________

Title ________________

Telephone Number ________________

________ SIC ________ SAMPLE

Current Employment at this establishment as of Aug. 10, 1967 ☐

Anticipated employment three years from now 1970. ☐

Anticipated employment five years from now 1972. ☐

1. If this is a branch of a larger corporation indicate the name and address of the home office. ________________

2. In the last five years have your Milwaukee area plant (s), (include Milwaukee, Ozaukee, Washington and Waukesha counties):

| | | |
|---|---|---|
| increased capacity 25% or more | yes____ | no____ |
| changed product lines | yes____ | no____ |
| relocated | yes____ | n0____ |

3. Within the next five years is your local firm planning to:

| | | |
|---|---|---|
| increase capacity 25% or more | yes____ | no____ |
| add a new product line | yes____ | no____ |
| relocate | yes____ | no____ |

4. Does this establishment have a formal* training program? yes____ no____

5. If the answer to number 4 was yes please specify the occupations for which training is given:

________________ ________________

________________ ________________

________________ ________________

________________ ________________

(use reverse side if necessary)

*By formal training program is meant formal in plant classroom training and/or tuition paid by the employer for vocational school training. This does not include formal apprenticeship, management training, or the usual short term on the job training given to employees.

**APPENDIX B**

Form 21

## INSTRUCTIONS FOR PREPARING PART II OF THE MANPOWER NEEDS SURVEY

A. Do not write in this column.

B. Occupations. List the occupations found in your firm. Do not include the unskilled occupations which require little or no training. Please group your occupations according to the outline on the questionnaire.

C. Current Employment. Enter in this column the number of workers currently employed by occupation.

D. Future Employment. For each occupation enter your estimates of the total number of workers you will require three and five years from now. In making your estimates please assume the following conditions:
   1. Qualified workers will be available to meet anticipated employment demands.
   2. The economic conditions that have existed for the past several years will continue through 1972.
   3. Scientific and technological advances will continue, affecting industrial production methods, manpower requirements, and consumption patterns.
   4. The present day normal workweek at your firm will continue through the forecast period.
   5. Your current plans for plant expansion or modernization will materialize according to schedule.

E. Replacement Needs. Enter the number of workers, by occupation, needed to replace those who will be promoted or will leave your establishment because of death, retirement, disability, or enter into the Armed Forces during the 1968 calendar year.

   If you are unable to make a judgement for the coming year, please indicate the extent of replacement needs which occurred during the past twelve months, by occupation.

F. Training and Promotions. List in the appropriate columns the number of workers expected to complete formal plant training programs conducted by your establishment for each occupation in the next three and five years, plus the number of workers in your employ which you expect to promote into that occupation from other jobs in the company in the next three and five years.

If further information is desired, please contact:
Wisconsin State Employment Service: 273-1162, Ext. 27

## APPENDIX B

| A | B | C | D | | E | F | |
|---|---|---|---|---|---|---|---|
| CODE | OCCUPATIONAL TITLE | CURRENT EMPLOYMENT | ANTICIPATED EMPLOYMENT | | REPLACEMENT NEEDS DURING 1968 | WORKERS COMPLETING COMPANY TRAINING IN: | |
| | | | 1970 | 1972 | | 1970 | 1972 |
| | Administrative Occupations | | | | | | |
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| | Engineering Occupations | | | | | | |
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Form 22

# INSTRUCTIONS FOR PREPARING PART II OF THE MANPOWER NEEDS SURVEY

A. Do not write in this column.

B. Occupations. The list of occupations may not be all inclusive for your company. If there are other occupations in your plant that are growing, declining or undergoing change please list them.

C. Current Employment. Enter in this column the number of workers currently employed by occupation.

D. Future Employment. For each occupation enter your estimates of the total number of workers you will require three and five years from now. In making your estimates please assume the following conditions:

1. Qualified workers will be available to meet anticipated employment demands.
2. The economic conditions that have existed for the past several years will continue through 1972.
3. Scientific and technological advances will continue, affecting industrial production methods, manpower requirements, and consumption patterns.
4. The present day normal workweek at your firm will continue through the forecast period.
5. Your current plans for plant expansion or modernization will materialize according to schedule.

E. Replacement Needs. Enter the number of workers, by occupation, needed to replace those who will be promoted or will leave your establishment because of death, retirement, disability, or enter into the Armed Forces during the 1968 calendar year.

If you are unable to make a judgement for the coming year, please indicate the extent of replacement needs which occurred during the past twelve months, by occupation.

F. Training and Promotions. List in the appropriate columns the number of workers expected to complete formal plant training programs conducted by your establishment for each occupation in the next three and five years, plus the number of workers in your employ which you expect to promote into that occupation from other jobs in the company in the next three and five years.

If further information is desired, please contact:
Wisconsin State Employment Service: 273-1162, Ext. 27

Form 22

| A | B | C | D | | E | F | |
|---|---|---|---|---|---|---|---|
| CODE | OCCUPATIONAL TITLE | CURRENT EMPLOYMENT | ANTICIPATED EMPLOYMENT | | REPLACEMENT NEEDS DURING 1968 | WORKERS COMPLETING COMPANY TRAINING IN: | |
| | | | 1970 | 1972 | | 1970 | 1972 |
| | Administrative Occupations | | | | | | |
| | Accountant | | | | | | |
| | Accountant, Junior | | | | | | |
| | Marketing Adminstration Occupations | | | | | | |
| | Production Manager | | | | | | |
| | Purchasing Agent | | | | | | |
| | Traffic Manager | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | Engineering Occupations | | | | | | |
| | Chemical Engineer | | | | | | |
| | Chemist | | | | | | |
| | Chemical Laboratory Technician | | | | | | |
| | Civil Engineer | | | | | | |
| | Draftsman, Structural | | | | | | |
| | Electrical Engineer | | | | | | |
| | Electrical Technician (include Electric-Laboratory Technician) | | | | | | |
| | Electronic Technician | | | | | | |
| | Instrumentation Technician | | | | | | |
| | Draftsman, Electrical | | | | | | |
| | Industrial Engineer | | | | | | |
| | Production Planner | | | | | | |
| | Time-Study Engineer | | | | | | |
| | Industrial Engineering Technician | | | | | | |

Form 23

# INSTRUCTIONS FOR PREPARING PART II OF THE MANPOWER NEEDS SURVEY

A. Do not write in this column.

B. Occupations. The list of occupations may not be all inclusive for your company. If there are other occupations in your plant that are growing, declining or undergoing change please list them.

C. Current Employment. List the number of employees by age, and sex for each occupation. If you do not have a record of the employees age and sex by occupation, make an estimate.

D. Future Employment. For each occupation enter your estimates of the total number of workers you will require three and five years from now. In making your estimated please assume the following conditions:

1. Qualified workers will be available to meet anticipated employment demands.
2. The economic conditions that have existed for the past several years will continue through 1972.
3. Scientific and technological advances will continue, affecting industrial production methods, manpower requirements, and consumption patterns.
4. The present day normal workweek at your firm will continue through the forecast period.
5. Your current plans for plant expansion or modernization will materialize according to schedule.

E. Training and Promotions. List in the appropriate columns the number of workers expected to complete formal plant training programs conducted by your establishment for each occupation in the next three and five years, plus the number of workers in your employ which you expect to promote into that occupation from other jobs in the company in the next three and five years.

If further information is desired, please contact:
Wisconsin State Employment Service: 273-1162, Ext. 27

APPENDIX B

| A | B | C | | | | | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CODE | OCCUPATIONAL TITLE | CURRENT EMPLOYMENT | | | | | | ANTICIPATED EMPLOYMENT | | WORKERS COMPLETING COMPANY TRAINING IN: | |
| | | Male | | | Female | | | | | | |
| | | UNDER 35 | 35-54 | 55+ | UNDER 35 | 35-54 | 55+ | 1970 | 1972 | 1970 | 1972 |
| | Administrative Occupations | | | | | | | | | | |
| | Accountant | | | | | | | | | | |
| | Accountant, Junior | | | | | | | | | | |
| | Marketing Adminstration Occupations | | | | | | | | | | |
| | Production Manager | | | | | | | | | | |
| | Purchasing Agent | | | | | | | | | | |
| | Traffic Manager | | | | | | | | | | |
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| | | | | | | | | | | | |
| | Engineering Occupations | | | | | | | | | | |
| | Chemical Engineer | | | | | | | | | | |
| | Chemist | | | | | | | | | | |
| | Chemical Laboratory Technician | | | | | | | | | | |
| | Civil Engineer | | | | | | | | | | |
| | Draftsman, Structural | | | | | | | | | | |
| | Electrical Engineer | | | | | | | | | | |
| | Electrical Technician (include Electric-Laboratory Technician) | | | | | | | | | | |
| | Electronic Technician | | | | | | | | | | |
| | Instrumentation Technician | | | | | | | | | | |
| | Draftsman, Electrical | | | | | | | | | | |
| | Industrial Engineer | | | | | | | | | | |
| | Production Planner | | | | | | | | | | |
| | Time-Study Engineer | | | | | | | | | | |

# APPENDIX C

Page

Questionnaire Forms Used in Employer Interviews:

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**APPENDIX C**

ALL EMPLOYERS

EMPLOYER'S STRUCTURED INTERVIEW

RESPONDENTS

---

ESTABLISHMENT________________________________________ SIC________

EMPLOYER NO.____ FORM NO..____ CURRENT EMPLOYMENT_______ '70_____ '72 __________

PERSON INTERVIEWED__________________________ INTERVIEWER_______________

CO. TITLE_______________________________________ DATE________________

PERSON WHO FILLED OUT FORM_________________________ TITLE ______________

---

QUESTIONS - CHECK LIST

---

| | LAST 5 YEARS | NEXT 5 YEARS |
|---|---|---|
| RELOCATION | ( ) | ( ) |
| EXPANSION 25% | ( ) | ( ) |
| NEW PRODUCTS | ( ) | ( ) |

---

IN-PLANT TRAINING ( ) BRANCH ESTABLISHMENT ( )

---

COMMENTS:

(Project staff completed these forms from information supplied by employers on the skill survey questionnaires. This information was used to determine which of the following specialized forms would be used in conducting individual employer interviews.)

ALL EMPLOYERS

## PROJECTIONS

DO YOU DO MANPOWER PLANNING ON A REGULAR BASIS?__________ yes(__) no(___)

PROJECTIONS MADE SPECIFICALLY FOR W.S.E.S. SURVEY

(1) By whom were the projections made? (title)__________________________

(2) If branch, was parent company consulted?______________yes(___)no(___)
If YES, did parent company make the projections?__________ yes(___)no(___)

_______________________________________________________________

(3) Were department heads consulted?_________________ yes ___ no ___

Plant Eng. ( ) Industrial Eng. ( ) Cost Acct. ( 0

Sales Mgr. ( ) Personnel Mgr. ( ) Ind. Rel. Mgr. ( )

(4) Were replacement needs considered? yes ___ no ___

If YES, HOW? (From past records etc.) ___________________________

_______________________________________________________________

_______________________________________________________________

(5) If computer - Are your personnel records on the computer? yes(__)no(__)

(6) Was new technology/work process considered? yes ( ) no ( )

_______________________________________________________________

(7) Does the company have new technology planned that is confidential in nature, which was not considered? yes ( ) no ( )

(8) Does management inform personnel/ Training Director of effect of new technology on labor skill needs? yes ( ) no ( )

_______________________________________________________________

_______________________________________________________________

(9) How difficult was it for you to provide age/sex information on current employment by occupation? COMMENT.______________________

_______________________________________________________________

_______________________________________________________________

(10) Were your projections based primarily on changes in sales? yes ( )
If NO, on what if anything?____________________________ no ( )

COMMENT.________________________________________________________

_______________________________________________________________

ALL EMPLOYERS

(11) Comment on your confidence as to the accuracy of occupational projections provided?

(a) Projection periods, (3years), (5 years)?

(12) Comment on the difficulty of selecting occupations on Form #21

(13) Comment on terminology problems on pre-listed form.

(14) Do you contact Vocational Educators when skill shortages occur?

yes ( )
no ( )

W.S.E.S. yes ( ) No ( )

THOSE DOING MANPOWER PLANNING

## PROJECTIONS

WHAT PROJECTIONS ARE REGULARLY MADE BY ESTABLISHMENTS ?

(1) Is the labor market capable of supplying your occupational skill needs?

COMMENT.

(2) Are the assumptions on which your manpower plans are based different from the ones contained in our questionnaire? yes ( ) no ( )

(3) Does your firm make sales projections yes ( ) no ( )
Are these projections related to manpower requirements? yes ( ) no ( )
(Large Firms) Through the use of input-output analysis? yes( ) no ( )

(4) Who is responsible for this planning effort? Title.

(5) Are projections made on overall employment? yes ( ) no ( )
(a) occupational employment? yes ( ) no ( )
(b) projection period?
(c) how often made?
(d) PLEASE COMMENT ON THE ACCURACY OF YOUR PROJECTIONS.

(e) WHAT USE HAS BEEN MADE OF YOUR PROJECTIONS?

(f) DO YOU INTEND TO CONTINUE/DISCONTINUE/EXPAND/CHANGE etc. YOUR MANPOWER PLANNING PROCEDURE IN THE FUTURE? COMMENT.

-2- PROJECTIONS　　　　THOSE DOING MANPOWER PLANNING

(6) If occupational projections were made, was it by:

(a) Plant ( )
(b) Department ( )
(c) Company Wide ( )
By -(d) Wage Classification ( )
(e) Occupational Title ( )

DETAIL:

| | | |
|---|---|---|
| (f) Professional/managerial/engineering | BROAD ( ) | SPECIFIC ( ) |
| (g) Technical | BROAD ( ) | SPECIFIC ( ) |
| (h) Skilled/semi-skilled | BROAD ( ) | SPECIFIC ( ) |
| (i) Unskilled | BROAD ( ) | SPECIFIC ( ) |

(7) (Large Firms) Are there any other types of projections made by this firm? (capital expenditure, equipment replacement, etc.) yes ( ) no ( ).

IF YES, COMMENT.________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

APPENDIX C

EXPANSION 25%

LAST FIVE YEARS (    )

NEXT FIVE YEARS (    )

INCREASED PRODUCTION 25%

(1) What (was,is) nature of expansion? ______________________

(a)Expansion of product lines?______________________

(b) Merger with another Company included as expansion?COMMENT.

(2) Was your labor requirements considered when planning expansion? COMMENT.

______________________yes (   ) no (   )

(3) As a result of expansion (was/will) new machinery/technology/production method be used? ______________________yes (   ) no (   )

(4) What effect did/will it have on personnel?______________________

(a) more/less/same numbers used?______________________

(b) Different skills used?______________________yes (   ) no (   )

4.

(c) Who trained/will train them if new skills needed?__________

______________________________

______________________________

______________________________

______________________________

______________________________

APPENDIX C

THOSE WITH NEW PRODUCTS

NEW PRODUCT LINES

(1) WHAT NEW PRODUCTS?

OLD PRODUCTS DISCONTINUED?

(2) HOW WILL THIS AFFECT EMPLOYMENT?

more/less/same numbers?

(3) WILL OLD EMPLOYEES BE RETRAINED? yes ___ no ___

BY WHOM?

(4) IS THIS CHANGE IN PRODUCTS A NEW INDUSTRY TREND? yes ___ no ___

(5) WILL THIS CHANGE AFFECT OTHER INDUSTRIES? yes ___ no ___

(6) WILL OTHER PRODUCT LINES GO OUT OF EXISTENCE? ( IN YOUR COMPANY) ___

(IN YOUR INDUSTRY)?

THOSE RELOCATING

## RELOCATION - LAST FIVE YEARS

RELOCATION LAST FIVE (5) YEARS.--WHAT WAS MOVED? ____________________

WHY? ____________________

MOVED IN LAST FIVE (5) YEARS.

(1) DID IT RESULT IN MODERNIZATION OF EQUIPMENT? yes ___ no ___
If yes, HOW? ____________________

(2) Computer? ____________________ yes ___ no ___

(3) Numbrical Control machines? ____________________ yes ___ no ___

(4) Has the move resulted in an overall change in employees skill level?
____________________ yes ___ no ___

(5) Are these shifts directly/indirectly related to the relocation of the plant? yes ___ no ___

(6) If new machinery has been installed, was it purchased in order to;
- (a) cut labor costs? yes ___ no ___
- (b) increase production? yes ___ no ___
- (c) name of new machines ____________________

-2- RELOCATION - LAST FIVE YEARS THOSE RELOCATING

(d) If a difference in skills resulted, where/how did the worker get special training?

SKILL____________________WHERE TAUGHT____________________

SKILL____________________WHERE TAUGHT____________________

SKILL____________________WHERE TAUGHT____________________

(e) Is there a need for Vocational School training for this/these and related jobs? yes ___ no ___

If YES, EXPLAIN.________________________________________

APPENDIX C

THOSE RELOCATING

## RELOCATION - NEXT FIVE YEARS

WILL RELOCATE IN NEXT FIVE YEARS

(1) What will be moved? ______________________________

______________________________

Why? ______________________________

______________________________

(2) Will machinery in the new plant be modernized? yes --- no ___

______________________________

______________________________

(3) Kind of machine? ______________________________

______________________________

(4) Will it (a) Increase production? yes ___ no ___
(b) Cheaper to operate? yes ___ no ___
(c) Cut labor costs? yes ___ no ___

(5) Will it affect number of people employed? yes ___ no ___

How? ______________________________

______________________________

(a) use more skilled/unskilled labor? ______________
(b) use more technical labor? ______________

(6) Is this machinery new to industry in U.S.A.? yes ___ no ___

(a) in WISCONSIN? yes ___ no ___

(b) What effect will it have on future employment? ________

______________________________

______________________________

(c) Special training? ______________________________

______________________________

By Whom? ______________________________

(d) Special skills required?______________________________

____________________________________________________________

____________________________________________________________

(e) Will personnel be promoted and will training take place within company? yes ___ no ___

(f) Will personnel (experienced) be hired from outside company with readily available skills? yes ___ no ___

____________________________________________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

____________________________________________________________

APPENDIX C

## FORMAL IN-PLANT TRAINING QUESTIONNAIRE

COMPANY ______________________ DIVISION ______________________

SIC ______________________

CO. REPRESENTATIVE ______________ TITLE ______________________

1 2

1. OCCUPATION

2. NATURE OF COURSE

3. LENGTH OF COURSE

4. GRADUATES 1966 ( ) 1966 ( )

5. ANTICIPATED 1970 ( ) 1970 ( )

ANTICIPATED 1972 ( ) 1972 ( )

6. a) UPGRADE INTO OCCUPATION (a) ( ) a) ( )

b) UPGRADE KNOWLEDGE(b) ( ) b) ( )

COMMENT:

7. Year Initiated

( ) ( )

8. Reason Initiated

# INSTRUCTIONS
# FOR
# INTERVIEW

Def. By formal training program is meant formal in plant classroom training and/or tuition paid by the employer for vocational school training. This does not include formal apprenticeship, management training, or the usual short term on the job training given to employees.

1. Occupational area for which firm conducts or sponsors a formal training program.
2. Nature of course -- in-plant, at school tuition paid, other.
3. Length of course -- in hours, semesters etc. number of courses held in a year etc.
4. Number that graduated from this course during calendar year 1966.
5. Number of employees, including those now in training, will have completed a training program in this occupation by (1970) and (1972).
6. a) Check if course is designed as training to upgrade employees into this occupation, or
   b) Check if course is designed to improve the skills or update the knowledge of employees currently in the occupation.
7. Year course was initiated.
8. Reason course was initiated -- i.e. new work methods, increase production, lack of qualified applicants coming into department.

APPENDIX C

NON - RESPONDENTS

---

ESTABLISHMENT________________________________________SIC__________

EMPLOYER NO.__________FORM NO._________CURRENT EMPLOYMENT__________

PERSON INTERVIEWED____________________INTERVIEWER________________

CO. TITLE______________________________DATE___________________

PERSON TO WHOM FORM WAS SENT____________________________________

TITLE____________________________________

---

(1) Why was the questionnaire not completed?

RANK IF MORE THAN ONE.

( ) a) questionnaire design ( ) ____________________________

( ) b) difficulty in making projections ( ) _____________________

( ) c) too costly/timely ( )________________________________

( ) d) Company policy on questionnaires ( )____________________

( ) e) Confidential-will not release figures ( ) ________________

( ) f) would not release to W.S.E.S. ( ) ______________________

COMMENTS._____________________________________________________

(2) Does the company do manpower planning?____________yes ( ) no ( )
IF YES, USE OTHER QUESTIONNAIRE IF POSSIBLE)___________________________

(3) Does the company inform local vocational educators of future skill needs.? yes ( ) no ( )

IF YES, IS IT DONE:

(a) Regularly?( ) yes ( ) no ( )

(b) when skill shortages occur? yes ( ) no ( )

(c) Other ( ) yes ( ) no ( )

## APPENDIX D

Page

Letter to Employers (Selected Nonrespondents) January 19, 1968 D-2

Employment Development and Training Survey D-3

## APPENDIX D

State of Wisconsin \ DEPARTMENT OF INDUSTRY, LABOR and HUMAN RELATIONS

LOCAL · STATE · NATIONAL

WISCONSIN STATE EMPLOYMENT SERVICE
MAILING ADDRESS: P.O. BOX 1607 ZIP 53701
OFFICES: 4802 SHEBOYGAN AVENUE
MADISON, WISCONSIN
TELEPHONE 266-3106 AREA CODE 608

January 19, 1968

Dear Sir,

Have Milwaukee area employers experienced skill shortages in the last several years? What adjustments in hiring or training have they made, and have area vocational and technical schools been informed of these adjustments?

The attached brief questionnaire will help us answer these questions. Please complete this form and return it to us in the envelope provided as soon as possible. Your answers will of course be kept confidential.

Sincerely,

James J. Hoppenjan

J.J. Hoppenjan, Coordinator
Project VISION

JJH:mew

Enc.

APPENDIX D

Employer Number: ______

## EMPLOYMENT DEVELOPMENT AND TRAINING SURVEY

Does your firm at any time attempt to determine the availability of skilled and semi-skilled workers in the Milwaukee Area? YES ( ) NO ( )

Within the last several years have you experienced a skill shortage?

YES ( ) NO ( )

If "YES", which of the following methods did you utilize in solving this shortage.

( ) Recruitment outside the Milwaukee Area.
( ) Use of newspaper advertisements.
( ) Recruiting through various employment agencies.
( ) Training programs financed by company.
( ) Training programs financed by schools and government agencies.
( ) Other ______________________________

In the last year have you hired:

Graduates of MSOE? YES ( ) NO ( )

Graduates of Milwaukee Vocational, Technical & Adult School? YES ( )

NO ( )

If your answer was "NO", to the above questions was it because:

( ) No training is offered for your skill needs.
( ) Were not hiring last year.
( ) Company training satisfied skill needs.
( ) Skill needs satisfied by another source.
Explain ______________________________

In the last year have you contacted the Milwaukee Area Vocational Schools about your training needs?

YES ( ) NO ( )

Is entrance into employment with your firm mainly confined to entry at the bottom of existing seniority units or promotion ladders except in the case of white-collar positions?

YES ( ) NO ( )

If "YES" does this policy necessitate on-the-job training programs?

YES ( ) NO ( )

# APPENDIX E

## RESULTS OF SPECIAL INDUSTRY STUDY
## THE METAL CASTING INDUSTRY - MILWAUKEE SMSA

Page

WORKSHEETS:

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APPENDIX E

WORKSHEET I

## AVERAGE ANNUAL TURNOVER RATES FOR SELECTED METAL CASTING ESTABLISHMENTS 1963-1967*

| TYPE OF ESTABLISHMENT | ESTABLISHMENTS | AVERAGE ANNUAL TURNOVER 1963-1967 | AVERAGE ANNUAL EMPLOYMENT 1963 - 1967 | AVERAGE TURNOVER RATE (PERCENT) |
|---|---|---|---|---|
| Die Casters | | | | |
| | A | 19.9 | 131.5 | 15 |
| | B | 78.2 | 104.5 | 75 |
| | C | 60.1 | 140.2 | 43 |
| | D | 92.0 | 94.2 | 98 |
| | TOTAL | --- | --- | 53 |
| Non-Ferrous Foundries | | | | |
| | A | 6.4 | 17.2 | 37 |
| | B | 66.0 | 44.5 | 148 |
| | C | 36.9 | 28.2 | 132 |
| | TOTAL | --- | --- | 121 |
| Iron Foundries | | | | |
| | A | 129.1 | 179.8 | 72 |
| | B | 48.6 | 138.8 | 35 |
| | C | 364.6 | 419.8 | 87 |
| | TOTAL | --- | --- | 74 |
| Steel Foundries | | | | |
| | A | 69.4 | 277.0 | 25 |
| | B | 141.2 | 388.8 | 36 |
| | C | 312.8 | 506.5 | 63 |
| | D | 541.5 | 746.8 | 73 |
| | E | 44.0 | 72.5 | 61 |
| | TOTAL | --- | --- | 56 |
| Permanent Mold Caster | | | | |
| | A | 72.5 | 50.8 | 142 |

---

*Period extends through 1966.

## DISTRIBUTION OF EMPLOYMENT IN METAL CASTING INDUSTRIES BY TYPE OF ESTABLISHMENT AND BY OCCUPATION

| TYPE OF ESTABLISHMENT | TOTAL NUMBER OF ESTABLISHMENTS | NUMBER SAMPLED | PERCENT OF TOTAL EMPLOYMENT SAMPLED | TOTAL ESTIMATED EMPLOYMENT | OVERHEAD & ADMINISTRATIVE & CLERICAL | PRODUCTION EMPLOYMENT | BENCH, FLOOR & PIT MOLDERS | MACHINE MOLDERS | BENCH, FLOOR COREMAKERS | MACHINE COREMAKERS | SMELTERS | | | WELDERS | ARC CUTTERS, SCARFERS | FLAME CUTTERS | MAINTENANCE MECHANICS | ELECTRICIANS | METALLURGICAL TECHNICIANS | OTHER TECHNICIANS | CRANE & HEAVY EQUIPMENT OPERATORS | HEAT TREATERS | WOOD PATTERNMAKERS | METAL PATTERN TOOL & DIE MAKERS | QUALITY CONTROL | MATERIAL SUPPORT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | FURNACE | CUPOLA & COKE | TOTAL | | | | | | | | | | | | | |
| STEEL FOUNDRIES | 9 | 6 | 82.0% | 3440 | 557 | 2883 | 29 | 205 | 39 | 84 | 26 | -- | 26 | 122 | 35 | 65 | 74 | 32 | 20 | 36 | 63 | 10 | 47 | 7 | 76 | 27 |
| CAPTIVE | 2 | 2 | | 963 | 113 | 850 | 36 | 20 | 21 | 7 | 7 | -- | 7 | 36 | -- | 19 | 22 | 9 | 5 | 3 | 19 | 3 | 14 | 2 | 22 | 8 |
| IRON FOUNDRIES | 22 | 9 | 63.6% | 4208 | 590 | 3618 | 24 | 379 | 31 | 171 | 23 | 26 | 49 | 47 | -- | 3 | 154 | 23 | 17 | 15 | 26 | 7 | 15 | 23 | 18 | 14 |
| CAPTIVE | 5 | 5 | | 1720 | 222 | 1498 | 46 | 85 | 59 | 35 | 4 | 10 | 14 | 19 | -- | 4 | 65 | 14 | 7 | 6 | 16 | 3 | 67 | 12 | 8 | 6 |
| NON-FERROUS FOUNDRIES | 15 | 9 | 74.5% | 630 | 84 | 556 | 25 | 58 | 24 | 30 | 24 | 2 | 26 | 8 | -- | -- | 22 | 1 | -- | -- | -- | 3 | 8 | 4 | 36 | 4 |
| CAPTIVE | 4 | 4 | | 315 | 38 | 277 | 10 | 19 | 17 | 10 | 12 | -- | 12 | 1 | -- | -- | 9 | -- | 2 | 2 | -- | 1 | 3 | 3 | 14 | 2 |
| DIE CASTERS | 8 | 4 | 63.5% | 780 | 123 | 657 | -- | -- | -- | -- | 10 | -- | 10 | -- | -- | -- | 20 | -- | -- | -- | -- | 6 | -- | 22 | 8 | 5 |
| CAPTIVE | 2 | 2 | | 432 | 62 | 370 | -- | -- | -- | -- | 63 | -- | 63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PERM. MOLD CASTERS | 9 | 7 | 62.0% | 412 | 58 | 354 | -- | -- | 2 | -- | 10 | -- | 10 | -- | -- | -- | 24 | -- | 2 | -- | -- | 3 | -- | 15 | 21 | 2 |
| CENTRIFUGAL CASTERS | 4 | 3 | 97.0% | 631 | 122 | 509 | -- | -- | 1 | -- | 41 | -- | 41 | 20 | -- | -- | 22 | -- | 13 | 5 | -- | 10 | -- | -- | -- | 5 |
| OTHERS (PRECISION CASTING PATTERNS, INVESTMENT CAST SIGNS) | 6 | 6 | | 118 | 19 | 99 | 4 | -- | 1 | 6 | 7 | -- | 7 | -- | -- | -- | -- | -- | -- | 2 | -- | -- | -- | 1 | -- | -- |
| TOTAL | | | | 13649 | 1988 | 11671 | 174 | 766 | 195 | 343 | 227 | 38 | 265 | 253 | 35 | 91 | 412 | 79 | 66 | 69 | 124 | 46 | 154 | 89 | 203 | 73 |
| PERCENT OF TOTALS | | | | | 14.6 | 85.4 | 1.3 | 5.6 | 1.4 | 2.5 | | | 1.9 | 1.9 | .3 | .7 | 3.0 | .6 | .5 | .5 | .9 | .3 | 1.1 | .7 | 1.5 | .5 |
| INDEPENDENT ESTAB. | | | | 10219 | 1553 | 8676 | 82 | 642 | 98 | 291 | | | 169 | 197 | | | | | | | | | | | | |
| PERCENT OF TOTAL | | | | | 15.1 | 84.9 | .8 | 6.3 | 1.0 | 2.8 | | | 1.7 | 1.9 | | | | | | | | | | | | |
| CAPTIVE OPER. | | | | 3430 | 435 | 2995 | 92 | 124 | 97 | 52 | | | 95 | 56 | | | | | | | | | | | | |
| PERCENT OF TOTAL | | | | | 12.7 | 87.3 | 2.7 | 3.6 | 2.8 | 1.5 | | | 2.8 | 1.6 | | | | | | | | | | | | |
| BY CATEGORY OF ESTAB. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| STEEL FOUNDRIES | | | | 4403 | | 3733 | 65 | 225 | 60 | 91 | | | 33 | 158 | | | | | | | | | | | | |
| IRON FOUNDRIES | | | | 5928 | | 5116 | 70 | 464 | 90 | 206 | | | 63 | 66 | | | | | | | | | | | | |
| NON-FERROUS FOUNDRIES | | | | 945 | | 833 | 35 | 77 | 41 | 40 | | | 38 | 9 | | | | | | | | | | | | |
| DIE CASTERS | | | | 1212 | | 1027 | -- | -- | -- | -- | | | 73 | -- | | | | | | | | | | | | |
| PERMANENT MOLD CASTERS | | | | 412 | | 354 | -- | -- | 2 | -- | | | 10 | -- | | | | | | | | | | | | |
| OTHERS | | | | 749 | | 608 | 4 | -- | 2 | 6 | | | 48 | 20 | | | | | | | | | | | | |

WORKSHEET II (CONT.)

## DISTRIBUTION OF EMPLOYMENT IN METAL CASTING INDUSTRIES BY TYPE OF ESTABLISHMENT AND BY OCCUPATION

| TYPE OF ESTABLISHMENT | PRODUCTION MACHINE TRADES | | | DIE CASTERS | | | PERMANENT MOLD CASTERS | | | CENTRIFUGAL CASTERS | | | OTHER CASTERS & MOLDERS | | | OTHER TRADES | ENTRY OCCUPATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SET-UP | OPERATE ONLY | TOTAL | SET-UP | OPERATE ONLY | TOTAL | SET-UP | NO SET-UP | TOTAL | SET-UP | NO SET-UP | TOTAL | SHELL | PLASTER | TOTAL | | |
| STEEL FOUNDRIES | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4 | 127 | 1676 |
| CAPTIVE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 64 | 492 |
| IRON FOUNDRIES | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 154 | 2442 |
| CAPTIVE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 35 | 987 |
| NON-FERROUS FOUNDRIES | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 6 | 8 | 299 |
| CAPTIVE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 3 | 163 |
| DIE CASTERS | 16 | 145 | 161 | 54 | 102 | 156 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 256 |
| CAPTIVE | -- | -- | -- | 25 | 208 | 233 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 74 |
| PERM. MOLD CASTERS | -- | 24 | 24 | -- | -- | -- | 16 | 92 | 108 | -- | -- | -- | -- | -- | -- | 16 | 124 |
| CENTRIFUGAL CASTERS | 213 | 50 | 263 | -- | -- | -- | -- | -- | -- | 35 | 32 | 67 | -- | -- | -- | -- | 62 |
| OTHERS (PRECISION CASTING PATTERNS, INVESTMENT CAST SIGNS) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 12 | 3 | 63 |
| TOTAL | 229 | 219 | 448 | 79 | 310 | 389 | 16 | 92 | 108 | 35 | 32 | 67 | -- | -- | 22 | 410 | 6638 |
| PERCENT OF TOTALS | | | 3.3 | | | 2.9 | | | .8 | | | .5 | | | .2 | 3.0 | 48.7 |
| INDEPENDENT ESTAB. | | | | | | | | | | | | | | | | | 4922 |
| PERCENT OF TOTAL | | | | | | | | | | | | | | | | | 48.3 |
| CAPTIVE OPER. | | | | | | | | | | | | | | | | | 1716 |
| PERCENT OF TOTAL | | | | | | | | | | | | | | | | | 50.5 |
| BY CATEGORY OF ESTAB. | | | | | | | | | | | | | | | | | |
| STEEL FOUNDRIES | | | | | | | | | | | | | | | | | 2168 |
| IRON FOUNDRIES | | | | | | | | | | | | | | | | | 3429 |
| NON-FERROUS FOUNDRIES | | | | | | | | | | | | | | | | | 462 |
| DIE CASTERS | | | | | | | | | | | | | | | | | 330 |
| PERMANENT MOLD CASTERS | | | | | | | | | | | | | | | | | 124 |
| OTHERS | | | | | | | | | | | | | | | | | 125 |

APPENDIX E

WORKSHEET III

# EXPERT INTERVIEW TABULATIONS FOR 72 ESTABLISHMENTS

## A. GROWTH FORECASTS BY EXPERTS, BY TYPE OF ESTABLISHMENT: (MILWAUKEE S.M.S.A.)

| TYPE OF ESTABLISHMENT | INCREASED-PRODUCTION FORECAST | WILL GROW AT SAME RATE AS ECONOMY | PRODUCTION WILL REMAIN STATIC | MODERATE DECREASE EXPECTED | SIGNIFICANT DECREASE EXPECTED |
|---|---|---|---|---|---|
| Gray Iron | 1 | 1[a] | 3[b] | 5 | - |
| Malleable Iron | 1 | 3[c] | 1 | - | - |
| Steel | 1[d] | 6 | 1[e] | - | - |
| Aluminum | 3 | 2 | 1 | 2 | - |
| Copper Alloys | 1 | 2 | 2[f] | 3 | 1[g] |
| Centrifugal Casters | 1 | 1 | 1 | - | - |
| Die Casting | 6 | 3 | - | - | - |
| Automatic Die Casting | 5 | - | - | - | - |
| Plaster, Precision Casting | - | 1 | - | - | - |
| Permanent Mold Casting | 5 | 2 | - | - | - |
| Investment Casting | 2[h] | - | - | - | - |
| Shell Mold Casting | 1 | 3 | - | - | - |
| Cast Signs & Displays | - | - | - | - | 1[j] |

Footnotes:

a. This spokesman referred only to establishments specializing in long production runs.
b. One spokesman spoke only for casting short run job lots.
c. Growth forecast only for casting in long production runs.
d. Spokesman forecast rapid growth only for long production runs.
e. Spokesman for establishment specializing in very large castings.
f. One spokesman referred only to production of short run job lots.
g. This spokesman oriented only to very small establishments.
h. Increase forecast only for Milwaukee S.M.S.A.
j. At time of survey, largest establishment in this field moving operations out of the State. Another small establishment in this field went bankrupt shortly after the survey.

## APPENDIX E

WORKSHEET III

### B. TRENDS IN INDUSTRY WHICH WILL AFFECT EMPLOYMENT PATTERNS

#### 1. MECHANIZATION AND AUTOMATION

| TYPE OF ESTABLISHMENT | CONSIDERABLE AUTOMATION TO BE EXPECTED | INCREASED MECHANIZATION TO BE EXPECTED | MECHANIZATION HAS REACHED ITS PEAK | SPECIAL COMMENTS |
|---|---|---|---|---|
| Sand Mold Foundries: | | | | |
| Gray Iron | - | 7 | - | a |
| Malleable Iron | 1 | 2 | - | a |
| Steel | 4 | 5 | - | b |
| Non-Ferrous | 2 | 7 | - | c |
| Permanent Mold Casters | - | 4 | - | - |
| Die Casters | 2 | 1 | - | - |
| Centrifugal Casters | - | 2 | - | - |
| Others | - | 2 | - | - |

FOOTNOTES:

a. Considerable changes to be expected. Revolutionary labor saving methods as well as mechanization will affect ratio of production volume to labor used.

b. Numerical control of smelting operations now a pilot project. In ten years this may begin to become a regular practice.

c. Automated (electronic control) material handling will become a part of operations.

#### 2. TRENDS IN CASTING REPAIR

| TYPE OF SAND FOUNDRY | MORE CASTING REPAIR | NO CHANGE | LESS CASTING REPAIR | WILL BE DISCONTINUED | SPECIAL COMMENTS |
|---|---|---|---|---|---|
| Grey Iron | - | 1 | 3 | 1 | a |
| Malleable Iron | - | - | 1 | 2 | - |
| Steel | 1 | - | 2[b] | - | a |
| Non-Ferrous | - | - | - | 4 | - |

FOOTNOTES:

a. Considerable shift in welding from conventional arc to gas shielded arc methods (usually $CO_2$).

b. One person clarified by stating that better quality control will reduce repair of steel castings, but some repairing will always be done (in steel).

In general, those who forecast continued casting repair referred to large castings, usually floor and pit mold type; those who stated it was going out entirely referred to or were oriented toward manufacture of smaller castings (except non-ferrous).

## WORKSHEET III

### 3. TRENDS IN PATTERN MAKING

| TYPE OF PATTERN | INCREASE EXPECTED | INCREASE WITH ECONOMY | STATIC | MODERATE DECREASE | SIGNIFICANT DECREASE |
|---|---|---|---|---|---|
| Wood Patterns | 2[a] | -[b] | 1 | 2 | 2 |
| Metal Patterns | 2 | 1 | 1 | - | - |
| Plastic Patterns | 3 | - | - | - | - |

FOOTNOTES:

a. One person qualified his statement by saying that more patternmakers will be required if loose pattern molders are not trained.

b. One individual forecast significant changes in the patternmaking trade, but did not explain himself.

## C. FORECASTS IN OCCUPATIONAL TRENDS IN INDUSTRY

### 1. MOLDING

| TYPE OR LEVEL | DEMAND WILL INCREASE | DEMAND STATIC* | DEMAND STATIC | DECLINE IN DEMAND |
|---|---|---|---|---|
| Hand-bench molding | 1[a] | 8 | 5 | 4[b, c] |
| Floor & pit molding | - | 5 | - | 3[b] |
| Machine molding | 3 | 1 | 1 | - |
| Automatic machine | 5 | - | - | - |

FOOTNOTES:

a. This forecast increase applies to dry sand only.

b. Decline only due to lack of replacements—feel that losses will exceed number of persons trained.

c. One person merely commented that trends in design make precision a more critical element.

* Demand Static, but replacement demand high and shortages exist.

**APPENDIX E**

Worksheet III

2. CORE MAKING

| TYPE OR LEVEL | INCREASE | DEMAND STATIC-- BUT REPLACEMENT NEED WILL CONTINUE | DEMAND STATIC | DECLINE IN DEMAND |
|---|---|---|---|---|
| Hand, Bench & floor | - | 11 | 7 | 3[a] |
| Machine Core-making | 4 | 1 | - | - |
| Automatic machine | 5 | - | - | - |

FOOTNOTE:

a. Decline anticipated only because insufficient replacements will be trained to meet losses.

3. TRENDS IN NEED FOR TECHNICIANS

| TYPE OF ESTABLISHMENT | GROWTH FORECAST IN[a] TECHNICIANS- GENERAL | GROWTH FORECAST IN ELECTRICAL-ELECTRONIC TECHNICIANS | GROWTH IN QUALITY CONTROL TECH. | OTHER COMMENTS |
|---|---|---|---|---|
| Sand Foundries | 15 | 3 | 3 | b |
| Die Casting | 1 | - | - | c |
| Centrifugal casting | 1 | - | - | - |
| Other Methods | 1 | - | - | d |

FOOTNOTES:

a. Primarily, this referred to use of technical personnel in general. It can be interpreted as "Foundry Technicians", strong in metallurgy.
b. One forecast a decrease in technicians; one a significant future demand for electro-mechanical technicians; one stated, "there is no real need in the industry for technicians"; one forecast a phenomenal increase in demand.
c. One individual guardedly forecast a "possible need."
d. One person forecast a need for technicians specialized in investment casting methods.

4. CLASSIFICATION OF COMMENTS CONCERNING INDUSTRY'S NEED FOR MAINTENANCE MECHANICS.

More needed in future - 24

Current Shortage - 8

Upgrading in skill needed - 3

More all-around Training Needed - 1

Mechanics will need more electrical maintenance Training - 1

III.

5. COMMENTS CONCERNING INDUSTRY'S NEEDS FOR ELECTRICAL TRADES.

Demand rapidly increasing - 2

Moderate increases in demand forecast - 19

More intensive training will be required - 3

The maintenance trades will require mechanical technology - 1

6. COMMENTARY REGARDING MELTING AND SMELTING OCCUPATIONS.

Demand will remain level - 8

Decline forecast - 3

"No problem in this area" - 2

Only experience can train people - 3

Significant changes will occur in nature of occupations - 8

"More technicians, fewer operators"

"Air furnaces will be removed (in our plant) in July -- less demand for experience, more technological data will be used"

"Decline in coke fired furnaces -- Technological data will replace need for long experience"

"More automation coming -- probable decline in melters"

"Continuous melt equipment will lessen need for operators, increase demand for mechanics"

"More electrical furnaces in future -- greater demand in technology -- less operator skill"

"Numerical control smelting now a pilot project. Metallurgical technicians will replace programmers -- smelters will be replaced"

A die caster: "Contract smelters will deliver molten aluminum ready for casting. This will displace melters."

III APPENDIX E
WORKSHEET III

7. UNSKILLED ENTRY OCCUPATIONS

| TYPE OF ESTABLISHMENT | INCREASED DEMAND | DEMAND WILL INCREASE AT SAME RATE AS ECONOMY | DEMAND WILL REMAIN STATIC | MODERATE DECLINE IN DEMAND | SIGNIFICANT DECLINE |
|---|---|---|---|---|---|
| Sand Mold foundries | 1 | 2 | 9 | 11 | - |
| Permanent Mold Casters | - | 1 | 3 | - | - |
| Centrifigual Casters | - | - | 1 | - | - |
| Die Casters | - | - | 1 | 4 | - |
| Other | - | - | - | 1 | 1[a] |

FOOTNOTE:

a. A sign and display establishment planning to move out of the state.

D. TRAINING RECOMMENDATIONS OF INDUSTRY EXPERTS

| AREAS OF NEED CITED BY INTERVIEWEES | SAND FOUNDRIES | DIE CASTERS | PERM. MOLD CASTERS | CENTRIFIGUAL CASTERS | OTHERS |
|---|---|---|---|---|---|
| 1. Basic Employability training, as CITE, DIC | 4 | 1 | 1 | - | - |
| 2. Basic Education plus employability training | 6 | - | - | 1 | - |
| 3. Basic Education, including some knowledge of metals | 3 | 2 | 2 | 1 | 1 |
| 4. General basic foundry training | 8[a] | - | 1 | - | 1 |
| 5. Molders and coremakers (school training) | 10[b,c] | - | - | - | - |
| 6. Molders and coremakers (apprenticeship-OJT) | 3[c] | - | - | - | - |
| 7. Maintenance Trades: all around | 7[d,e] | - | - | - | - |
| mechanical | 1 | 1 | - | - | - |
| electrical-electronic | 2 | 1 | - | - | - |
| 8. Die Casting Trades | - | 1 | - | - | - |

**APPENDIX E**
**WORKSHEET III**

II - D

| TRAINING NEEDS CITED | SAND FOUNDRIES | DIE CASTERS | PERM.MOLD. CASTERS | CENTRIFUGAL CASTERS | OTHERS |
|---|---|---|---|---|---|
| 9. Technicians[f] | 7[g,h] | - | - | 1 | 1 |
| 0. "Better Training and selection" | 1 | - | - | - | - |
| 11. "None" | - | - | - | - | 1 |

FOOTNOTES:

a. One qualified statement by stressing need for pre-exposure to environment.
b. One stressed need for this training for its employees on tuition refund program.
c. One stressed pre-exposure to actual working environment early in training.
d. One stressed training to upgrade skills of mechanics to meet technological changes.
e. This recommendation was for school training of employees—tuition refund program.
f. Six stressed "all around foundry technicians" strong on math and metallurgical; the other for specialized quality control technical specialists.
g. One specified "technicians and engineers".
h. One insisted that schools must "upgrade" their technician training.

WORKSHEET IV

### COMPARISON OF SAMPLING BY ACTIVITY VS. SAMPLING BY S.I.C.

| TYPE OF ESTABLISHMENT | MOLDERS | MACHINE MOLDERS | COREMAKERS | MACHINE COREMAKERS | SMELTERS | MAINTENANCE MECHANICS | TOTAL TECHNICIANS | WELDERS | ENTRY | PERMANENT MOLD-SET-UP | PERMANENT MOLD CASTERS-OPER. | DIE CASTERS-SET-UP | DIE CASTERS-OPERATE | CENTRIFUGAL CASTERS-SET-UP | CENTRIFUGAL CASTERS-OPERATE | OTHER MOLDING & CASTING TRADES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Steel Foundries | 23 | 164 | 31 | 67 | 14 | 59 | 37 | 82 | 906 | -- | -- | -- | -- | -- | -- | 4 |
| Iron Foundries | 15 | 236 | 20 | 109 | 30 | 94 | 19 | 28 | 1256 | -- | -- | -- | -- | -- | -- | -- |
| Non-Ferrous Foundries | 18 | 42 | 17 | 22 | 18 | 16 | -- | 6 | 215 | -- | -- | -- | -- | -- | -- | -- |
| Die Casters | -- | -- | -- | -- | 6 | 13 | -- | -- | 162 | -- | -- | 34 | 65 | -- | -- | -- |
| Centrifugal Casters | -- | -- | 1 | -- | 18 | 21 | 18 | 20 | 40 | -- | -- | -- | -- | 13 | 30 | -- |
| Perm. Mold Casters | -- | -- | 1 | -- | 6 | 15 | 2 | -- | 76 | 10 | 57 | -- | -- | -- | -- | -- |
| Misc. Operations | 6 | -- | -- | 6 | 7 | -- | 2 | -- | 63 | -- | -- | -- | -- | -- | -- | 12 |
| Total Sample | 62 | 442 | 70 | 204 | 99 | 218 | 78 | 136 | 2718 | 10 | 57 | 34 | 65 | 13 | 30 | 16 |
| Extension by Activity for Casting Industry | 82 | 642 | 98 | 291 | 169 | 316 | 105 | 197 | 4922 | 16 | 92 | 54 | 102 | 35 | 32 | 22 |
| Extension by SIC Codes A | 96 | 679 | 108 | 314 | 152 | 337 | 122 | 209 | 4170 | 15 | 88 | 52 | 100 | 20 | 46 | 25 |
| Percent Variation | 17.3 | 5.5 | 10.1 | 7.9 | -10.1 | 6.7 | 16.2 | 6.1 | -15.5 | -9.4 | -4.4 | -3.7 | -2.0 | -42.8 | 43.4 | 13.6 |
| 53.6% Blow-up Average Variation | =13.1% | | | | | | | | | | | | | | | |
| Ext. Skill Survey 33 Codes | 453 | 397 | 299 | 14 | 14 | | 60 | 214 | | | | | | | | |
| Above corrected for reporting errors | 117 | 845 | 143 | 68 | 14 | | 60 | 214 | | | | | | | | |
| Percent Variation | 38.9 | 31.7 | 45.9 | -- | -- | | -42.8 | 7.9 | | | | | | | 1.5% | |
| Average Variation | =29.1% | | | | | | | | | | | | | | | |
| Captive Foundries (100% sampling) B | 92 | 124 | 97 | 52 | 95 | 96 | 26 | 56 | 1716 | | | | | | | |
| Extended Skill Survey-Other than 33 Codes | 184 | 144 | 1053 | 0 | | | | | | | | | | | | |
| Above Corrected for Reptg. Errors | 184 | 144 | 183 | 79 | | | | | | | | | | | | |
| Percent Variation | 100% | 13.9 | 88.7 | -- | | | | | | | | | | | | |
| Foundry Study-Total | 174 | 766 | 195 | 343 | | | | | | | | | | | | |
| Skill Survey Corr. Total | 301 | 989 | 326 | 147 | | | | | | | | | | | | |
| Percent Variation | 61.4 | 29.2 | 67.3 | -- | | | | | | | | | | | | |
| Average Variation | =40.6% | | | | | | | | | | | | | | | |

Footnotes:

A) S.I.C. 332, 336

B) Foundry Occupations found in establishments coded under S.I.C. Codes other than the 33 Group.

## APPENDIX E

Additional commentary based on interviews with industry experts in a study of the Metal Casting Industry--Milwaukee S.M.S.A. (See Chapter V)

### IMPORTANT TRENDS IN THE INDUSTRY

This study covered all types of metal casting activities since there is a considerable interrelationship from an economic point of view. However, an overall analysis of the whole industry is difficult because each segment (or activity) in this industry was found to have significant differences in trends, future outlook, and occupational patterns. Therefore, it is necessary to describe the trends in each segment. It must be kept in mind that this analysis centers on the Milwaukee S.M.S.A. and points toward area trends rather than national trends.

1) Gray iron sand foundries. This segment of the industry has been static in the area for many years. Although manufacture of metal products has increased, gray iron foundries have not kept pace. This has been due, in part, to replacement of castings by other methods of manufacture, particularly welded fabrications. Another factor is the tendency to produce machinery components in smaller sizes (for example, a motor block of a given horsepower can now be manufactured using a smaller engine block than years ago, as a result of improved design.) Eighty percent of the persons speaking for this industry predicted that gray iron foundries will either remain static or decline further because the factors behind its past lack of growth remain in effect. Still another factor is that the foundries in this area are behind in their state of technology. Nonetheless, a considerable amount of mechanization has taken place, and all persons commenting on this expect

that many changes in machinery and equipment will be made in the next few years. A few expect this to revolutionize the industry, resulting in a recapture of business previously lost to other metals or manufacturing methods. In any event, it will require fewer laborers in the future, and much more attention to maintenance and quality control and to technologists.

2) Malleable and ductile iron. These foundries have fared better than gray iron over the years. In part, this is because some forms of malleable iron castings cannot be replaced as easily by weldments, but other factors are also involved. Most significant, perhaps, is that uses made of such castings lend themselves better to higher production runs. As a result, the technology of this branch of the industry is more advanced than gray iron. Customer demands for quality are stringent; therefore improved machines, improved engineering, and advanced methods are taking over. Most persons speaking for the industry forecast continued trends in mechanization, modernization in machinery, better sand control, and some automation. (One captive plant is one of the most modern foundries in the area.) It is generally expected that this branch of the industry will grow at least as fast as the economy. Even though fewer workers per unit of output will be required it is expected that overall employment will rise a little, perhaps an average of 5% per year (long term), because of increased output. Demands for technologists, quality control, and maintenance will increase while skilled production trades will decline.

3) Steel foundries. In the past, the business of steel foundries has gyrated so sharply with economic and business cycles that an overall trend is difficult to gage; but over a period of the last decade,

this business does not appear to have kept pace with the economy, due to many of the same factors which have affected gray iron. This industry, however, is now undergoing a great deal of change, and it appears to be in a technological revolution at this time. The majority of establishments are now engaged in heavy capital spending for various types of automated material handling equipment, replacing old cupolas with modern electric (or, in some cases, oil - gas) furnaces, improving sand control methods, new molding machinery, and programs to improve working conditions (two are now air-conditioned). One establishment is piloting a numerical control smelting operation. As a result, spokesmen for this activity are anticipating considerable improvement and expect further growth. Production per worker is expected to increase rapidly, but overall business could increase so much that overall employment will hold, possibly rise. It is expected that maintenance mechanics, electricians, technicians of various orientations (metallurgical, industrial engineering, quality control, sand control, electronic), and inspectors will be in increased demand. The skilled trades (molder, coremaker) will remain in demand; and machine operators may increase a little, but their skill demands may be less stringent.

4) Stainless steel and ferrous alloys. Except for one stainless steel foundry, these activities "are where you find them" in the Milwaukee area and could not be statistically analyzed as a unit. Stainless steel casting was found in combination with other activities, such as non-ferrous foundries, steel foundries, and non-ferrous alloys. (The latter were also found combined with other activities.) The size of this business is relatively small and will not have much effect on the overall picture, but should maintain its growth with the overall economy.

5) Non-ferrous foundries. Although a few foundries specialize in either copper alloys or aluminum, these metals were usually cast by the same establishments. Most of the establishments involved were small operations, employing from one to less than 100 persons. Production runs in this segment of the industry vary considerably. There are a few establishments which are becoming mechanized and producing castings in long production runs, but many of them are jobbers in small lots. Although many establishments contract both brass and aluminum work, the trends in production of these metals have been different. In general, establishments which have contracted work for both metals have increased the percentage and amount of aluminum cast while copper alloy casting production has dropped. Trends in relative costs of these metals has been a factor. Forecasts of trends have been mixed for both metals. Overall uses of aluminum are expected to increase considerably, and some experts expect that sand mold casting production will follow suit, especially because modernization of facilities and mechanization will lower costs, and improved quality control methods (especially in sand and melting) will improve quality. Other experts point out, however, that sand molding casting has limitations in length of production runs which are profitable, and that demand for larger quantities results in a business loss to other methods, i.e., die and permanant mold casting. (As a result, many aluminum foundries are entering the permanant mold casting business.) Experts who forecast a decline in business generally referred to smaller operations in a backward state of technology. Such organizations might subsist on very short run contracts, but a shortage of loose pattern molders could put them out of business. Most copper alloys (brass, bronze, copper-iron alloys) are cast by product manufacturing establishments which operate their own foundries. These establishments are in process of modernization at this time -- improved sand handling and mixing, better molding

machinery, automatic coremaking, improved melting facilities, and automated or mechanized material handling. They feel that their foundry employment will rise, but relative demand for unskilled labor will drop. More mechanics and technicians may be needed. The jobbing foundries have turned to increasing their production of other metals and/or other methods of casting. Although some expect jobbing of sand mold casting of copper alloys to hold up, many feel it will decline. One problem is that many of these establishments are in a backward state of technology; another is the shortage of loose pattern molders and skilled coremakers, vital to very short run jobbing.

6) Centrifugal casting. Most centrifugal casting is done by two large establishments. Both have been making capital investments to improve facilities, mechanize material handling and improve melting and pouring. There has been an upward trend in production in this activity and all factors behind it are still in effect. One sand mold foundry is installing centrifugal casting equipment and will enter this field. Increased demands for maintenance personnel and technicians are expected to result from this.

7) Permanant mold casting. This form of casting becomes profitable when long production runs are in demand. (Some casters regard 5000 pieces as a "rule of thumb", depending on design of casting and metal cast.) This method is practical for metals which can be cast at temperatures which will not affect ferrous dies. Most permanent mold castings are of aluminum in this area. Since use of aluminum seems to be increasing and the overall expansion of the economy results in more products sold (and a larger volume of each component required), there has been considerable growth experienced in this method. Therefore, past growth has been significant and the trend is expected to continue.

The limiting factor lies in the fact that very high production runs can be better produced by die casting. Increases in permanant mold casting will increase the demand for metal die and pattern makers.

8) Die casting and automatic die casting. In the past there has been a significant increase in production in this method, but overall employment has increased at a much slower rate. The factors behind the increase of permanant mold casting also affect the use of die casting. In addition, there has been significant improvement of methods and machinery, especially the increased use and development of automatic die casting machinery. A number of establishments are making further capital investments at this time, and further increases in use of this method are anticipated. Conversion to automatic machinery will, however, have some effects on occupational trends. Usually, operator skill is no longer needed. A maintenance mechanic sets up the job, and the operator tends or merely feeds and off bears the machine. Fewer tenders, fewer material handlers and helpers will reduce requirements for unskilled workers. A greater demand for maintenance mechanics and tool and die makers will probably be another result. There was a difference of opinion as to whether this industry will begin to use technicians. One expert expects quality control to be a growing problem. One other development should be noted which could have a significant effect. A contract smelting firm is now under construction. This establishment will deliver molten metal in heat controlled trucks to its customers, ready for pouring into machines. This could result in the displacement of melters in long production run operations.

9) Other casting operations. There are a number of other casting operations in the area. These are not of significant size at the present time, and are unlikely to have much effect in this area in the near future:

a) Plaster precision casting. Primarily used in this area for casting metal patterns for foundries. Only two firms (one recently organized) in this field. Both will continue as very small operations. Modest growth is expected.

b) Investment casting. Only one firm plus a captive operation are of any significance at this time. Some experimentation underway to adapt this method to new components and products. Considerably increased use of this method expected in the area, but it is not expected to be significant in the near future. A few new technicians may be required in the future.

c) Cast signs and displays. This activity will virtually disappear in the area. Since the study was made one firm moved out of the state and another went bankrupt. A few loose pattern molders were "released to the industry." Only one very small firm still operating. No renewal of this activity foreseen.

d) Shell mold casting. There has been some growth in use of shell molds for casting in the area, but use of this method never did develop to the extent expected a decade ago. Perhaps the primary use of shell molding has been in coremaking. This method of making molds results in castings requiring less machining or metal finishing (in some cases none at all). No actual skill is required of operators unless they are expected to do all set-up of automatic equipment (and this is seldom the case). Some increased use of shell molds and cores is expected, but no great effect on occupational patterns is likely to result.

APPENDIX E

## OCCUPATIONAL PATTERNS AND TRENDS

During the preparatory stages of this study it became apparent that no "occupational patterns" as such could be developed for a "Metal Casting Industry" or a "Foundry Industry". This broad industry contained various activities, or categories, each of which had its own peculiar pattern of occupations. Therefore, Worksheet I was compiled to show the patterns in each of the various categories. Three general types of occupations are found in these industries:

1) Occupations peculiar to or primarily found in metal castings activities.
2) Occupations found in most manufacturing industries.
3) Inter-industry occupations found throughout the economy.

It stands to reason that experts in a given industry can speak on occupational trends only for occupations found within their own industry; and they can only comment on the effects their industry might have on occupations with a broader application. This analysis will deal with each group separately.

1) Occupations which are peculiar to or primarily found in the metal casting industry.

   a) Skilled molders; i.e., loose pattern bench, floor, and pit molders. Although there are a number of significant differences between the skill, training, experience and physical demand requirements within this broad category, all such occupations could emerge from a common core of vocational training; therefore, they were grouped. About 175 persons are employed in these trades in the Milwaukee S.M.S.A., most of them in foundries which produce large floor or pit molded castings. Most of the remainder are employed by small jobbers specializing in small job lot production. Presently the total number of molders employed is declining, in part due to improved molding machinery, patterns and methods, and in part because very few persons are being trained. Most industry experts believe that future demand will be relatively static but that many more could be absorbed at this time. Few are now being trained (the majority of them in training programs in captive foundries), and many trainees never complete training. It was also reported that many quit the trade ( a study of Employment Service applications revealed that a number of persons in contruction and longshoreman occupations had formerly been foundry molders), and that a good percentage (possible over 30%) now employed are over 55 years of age. Although no great expansion in demand for this trade is expected, a need for training will continue. Many industry experts stress that improved selecting of trainees and pre-exposure to environment is essential. A few persons recommended a step-up in apprenticeship training, but the majority questioned whether this is necessary, even to the point of believing that such indentured programs would further limit entry into the occupation. On-the-job training, or school-work experience training seemed to meet with more approval.

b) Skilled coremakers. About 200 now employed in this area. This trade seems to follow many of the same trends as molding. Shortages, however, do not appear to be as acute and needs not as urgent. Some employers felt that molding and coremaking might be covered by the same training program with specialization coming later. In both cases, basic fundamentals were stressed.

c) Machine molding. Most employers felt that the various methods and machines used in molding can come from the same training programs. None indicated that they would require a "machine operating" specialization -- many actually rotated employees among various types of molding machines. Therefore, these occupations were counted in a single group. About 770 machine molders are employed in this area, the greatest number in iron foundries, and most of the others in steel. Perhaps the most significant differences found among machine molders was not in the machine operated, but in the variances in tasks expected of them from one establishment to another. In some cases everything was set up for them, the machine did all the work, and little skill was required; in other cases, the machine molder set up the flasks; controlled the machine, and has to do some core setting and hand tamping, thereby requiring some skill and training. (Usually the highest skill demands were in smaller non-ferrous and some steel foundries; the least skill was required in malleable iron, longproduction occupations.) Most experts agreed that some increases in machine molders would take place, perhaps an average of 3 - 4% per year. This, however, is not the most significant factor. High turnover tends to continually create vacancies, and need is perpetual. This appears to be an area for short-term training courses, such as M.D.T.A. Employers stressed knowledge of basic methods, materials, general familiarization and pre-exposure to environment rather than stress in training for particular methods (which may not apply to their plant). Most persons are currently trained on-the-job or by plant training programs.

d) Machine coremaking. This category was grouped, but includes a number of levels. Although about 350 machine coremakers are reported, as many as 30% are actually feeders - offbearers of automatic machines and do some core assembling and finishing as well, thereby requiring some skill and experience. Many operatives in core rooms rotate among various machines. At present there is a considerable trend toward automatic machines and improved methods. The number of core room employees may not rise much in the future even though more machine coremaking will be done. Turnover in core rooms is lower than other foundry departments, probably because working conditions are somewhat better. In any event, employers show little interest in training for machine coremakers, feeling that persons engaged in "general employability" or general foundry training would qualify for entry in this department.

e) Die casters. This occupation is, of course, peculiar to die casting operations. Two distinctly separate levels are involved: workers who set up machines, either for their own operations or for other workers; and workers who only operate machines. In each case, some companies expect die casters to do their own melting; others do not (but indicate they would still like their workers to know something about it -- especially set-up men). About 80 die casters with set up skills, and 310 "operators only" are employed in this area. It is expected that this business will increase, resulting in some increased demand for skilled die casters; but change-over to automatic machines will lessen this demand and result in some skill reduction of "operators only". One corporation executive was actively seeking a training program from a vocational school in his area; two others thought it might be helpful. One captive operation could not benefit from training because of a "promotion through posting" system in the plant.

f) Permanent mold castings. This activity also has several levels of skills depending upon whether workers are expected to set up their own dies and/or do their own melting. About 15 workers set their own dies and about 90 operate only. No great skill is required in this field, and most employers regard a basic education as a sufficient training requirement. Increases are expected in these occupations.

g) Centrifugal casters. Here again, different skill levels exist due to differences in the way in which firms operate. About 35 are expected to set up machines and about 30 are not. Although increased demand for centrifugal casters is expected, no interest in pre-training other than basic education was expressed by employers.

h) Melting and smelting occupations. Not all persons in this area engaged in melting or smelting of metals are employed by metal casting establishments, but this activity accounts for the large majority of them. This broad field actually contains several levels of occupations, ranging from tenders of small melting furnaces to cupola operators. About 40 cupola and coke furnace operators are still employed as such in this area, but several cupolas and coke furnaces are scheduled for replacement by other melting methods such as electric furnaces. This occupation, which most experts feel can be acquired only by experience, appears to be on the decline. About 225 persons are employed as operators of other kinds of melting furnaces, such as oil, gas, electric, and of varying types - crucible, reverberatory, and induction. Technological changes and replacement of equipment seem to be rapidly taking place in this field. Many experts forecast that sophisticated push-button controls, automatic chargers, and other mechanization will reduce operator skill requirements. One pilot operation, to convert melting to numerical control, has recently been installed. This replaces furnace operators with programmers (metallurgical technicians are needed). It is expected, however, that it will require 10 years to prove the value of this operation. Contract smelting (as discussed under die casting) may also reduce the number of melters used in die casting and possibly in permanent mold casting.

There did not seem to be a great deal of employer interest in specialized training for melting trades. A good training program covering melting integrated with metallurgy for technicians (and possibly a tuition refund for foremen and supervisors) appeared to be of more interest.

i) Casting cleaning and repair. This was not studie separately for an employment matrix of the industry, but was included under "entry occupations." This is due, in part, to the fact that each foundry operated in a different manner with considerable differences in methods and job task assignments. Most workers are engaged in grinding-chipping, casting cleaning, visual inspection and some chipping. Most establishments regard this as an entry department and feel that it should be a part of "general foundry" training suitable to programs such as MDTA.

j) Quality control occupations. This is actually a grouping rather than an occupation. About 200 employees are engaged in tasks below technician level in such tasks as dimensional inspection, sand control, routine metallurgical testing, sample preparation, and melt temperature control. Although "foundry technologists" and lab technicians may start on tasks such as these, most foundries feel that anyone with the equivalent of high school training can easily be broken in on any of these occupations, and feel that no specialized training, as such, is needed.

k) General foundry entry, laborer, and helper occupations. About 6600 employees are now engaged in a variety of tasks including material handling, helpers to molders, furnace and machine operators, casting cleaning, machine feeding, and pouring. Although there are differences in requirements of training, experience and physical demands, all are either entry positions or are filled by upgrading of entry workers. Although the industry in general expects some increase in employment, the number of workers engaged in these tasks will remain static or decline. This is due to increasing mechnization, improved methods and better engineering of work and plant lay out. This, however, does not preclude demand for training or future demand for employees. A study of turnover of establishments sampled for labor market information during the years of 1963 thru 1966 reveals an average annual turnover ranging from 56% in steel foundries to 121% in non-ferrous foundries (die casters reported a turnover of 53%). Since this figure represents the entire establishment, and most turnover is reported by employers to be in entry occupations, continuing demand is apparent.

There has been considerable variance in the opinion of employers on how to meet this problem. Many agree that some form of poverty program training offers a real hope for improvement. Considerable variation existed, however, in the recommendations for the type of training which would help. Eight employers felt that general basic foundry training, such as now offered by MDTA, is helpful. They stress, however, that such training should be general. Considerable objection was expressed to training in any method or procedure because it usually does not apply to their operations. They want trainees to have a general understanding of foundry practice, pre-exposure to the environment, some "feel" of basic, overall tools and equipment they may use. Thirteen employers felt that some combination of basic (elementary) education and employability training was the most important need for their industry. The "three R's"; knowing enough to get to work every day - and on time; knowing how to understand and follow instructions and abide by company rules--all this was regarded as the primary need. Many employers stressed training in fiscal responsibility--handling money and avoiding debts and possible garnishment. Six of these felt that basic education plus employability was necessary for entry into their establishments.

2) Occupations found throughout manufacturing establishments. This study can indicate only the effect of the metal casting industry upon the future trends of the following occupations. It must be kept in mind that in most cases the effect of this industry represents only a small fraction of total trends in such occupations.

a) Patternmaking. This is an occupation usually associated with the foundry industry. An occupational count cannot be obtained through the industry because most patternmaking is done by contract shops; and some of these contract shops also make patterns for purposes other than casting metal. Basically, there are three trades to be considered in patternmaking:

(1) Wood patternmaking, the old standby. Curiously, few foundrymen seemed inclined to discuss trends in this area. In general, decline was forecast, although one or two small jobbers thought that the disappearance of loose pattern molders might result in an increase. Longer run work resulting in greater use of metal patterns, modernization of methods, and continued engineering developments which are increasing the feasibility and use of plastic patterns are all playing a part in affecting the use of wood patterns. Some wood patternmaking will continue, but

many believe that it will diminish. At present, about 150 (many of them only pattern repair men) are employed by foundries and about 300 in contract shops.

(2) Metal patterns. This trade is more closely related to tool and die work in skill requirements and workers' knowledge than to wood patternmaking. About 90 workers engaged in die and pattern work are employed by metal casting companies. It is very difficult to estimate the amount of metal patternmaking outside of the industry. Some is done by contract pattern shops and some patterns are made by tool and die shops. Some product manufacturers make their own dies and patterns. In general, some increases in metal patterns can be expected.. (Pattern casting could also have an effect on this.)

(3) Plastic Patterns. At present there are not very many workers engaged in this trade; but it is believed that engineering research and development into greater utilization of this method will result in dynamic changes, thereby significantly increasing the use of plastic patterns. It is also quite likely that significant changes in methods used to manufacture plastic patterns will result in some changes in worker knowledge and skill requirements of plastic patternmakers. This may be regarded as a potential emerging occupation which should be watched by vocational educators.

b) Maintenance trades. About 410 employees are now employed in mechanical and structural maintenance and 80 in electrical maintenance in this industry. In addition, there are about 40 who specialize in mason trades engaged in furnace and ladle repair. This does not represent the total demands, however. Few establishments actually do all of their own maintenance work. Many of them contract much of their maintenance work from the outside, such as machining, millwright work (including fabrication and welding), major mechanical overhaul, firebrick installation and repair, and electrical work. Metal casting companies do as much as 80% of their own mechanical maintenance, 50% of their structural maintenance and probably no more than 25% of their own electrical maintenance.

Another factor which makes the estimate of maintenance requirements difficult (as far as numbers engaged in occupations are concerned) is the fact that maintenance for many of the captive operations is done by the parent plant's maintenance department, and the workers are not included in the foundry employment.

There are a number of categories of maintenance trades involved, each of which has different skill requirements. There were very few workers found (perhaps less than 15) who were skilled in all types of work--able to do their own machining, mechanical repair, and structural repair (including lay-out and welding). Few of these also did electrical work. Most workers specialized in one of the following trades:

(1) Mechanical repair, requiring knowledge of mechanics, hydraulics, pneumatics. This included over 300

of the workers involved. A few could machine their parts; a few could weld and do some structural maintenance as well. All authorities predict that technological advances and mechanization will result in a significant increase in demand for mechanics, perhaps over 10% per year. Some stressed a need for upgrading of skills.

(2) Structural repair - millwright. A few establishments employ structural maintenance men or union millwrights who are engaged in floor lay out, machinery installation and structural repair. In other establishments, maintenance mechanics are also trained to do this work. Perhaps 70 to 80 structural maintenance men are employed by the industry, covering about 50% of its needs. Inasmuch as mechanization and new capital outlay are continuing at a rapid pace, and increased mechanization requires greater maintenance of all types, an increased demand for these trades can be expected.

(3) Electrical maintenance. At present there are about 80 persons employed in the industry, but most of this work is contracted from electrical companies. This is a field rapidly growing in demand, and this trend is expected to accelerate. Increasing installation of electrical controls, automatic machinery and electrical furnaces, and control panel methods of operating all types of equipment are requiring not only larger numbers of electricians, but also considerable upgrading of knowledge, particularly electronics. The old fashioned electrician who knew layout and codes seems on the way out. A broad knowledge of electronics is becoming increasingly important in the field of electrical maintenance. One establishment has employed an electronic technician to repair some of the more complex equipment. Most employers feel there is no danger of training too many persons for the future demands in this field.

(4) Firebrick masons and masonry repair. About 40 persons are employed directly in this work in the industry, but some of it is done by other workers. Some establishments expect the furnace operator and his helpers to do all but major repairs. Most of this work, however, especially major repairs and re-building, is contracted on the outside. Changes in furnace design, conversion from coke fired furnaces to other types, and greater compactness of heating units may lessen demands for these trades a little.

In general, the maintenance field is the one in which employers show the greatest expectation for future demand, At present, about 80 employees are in training, either in a formal program or working as helpers in an OJT situation, in maintenance trades. It is felt that vocational education can step up programs in this area. Of significance, however, none requested training as "foundry mechanics." They were most interested in the basics -- communications, mathematics, general science, mechanics, hydraulics, pneumatics, structural lay-out, basic electricity. Also, if possible, principles of machining and and welding. It was felt that the type of mechanic they hire should be a person who could apply his knowledge and skills over a wide range of industry. They can train him in the peculiarities of their machines.

c) Technicians. This, of course, is a broad term, covering various orientations. Most employers seemed more interested that a man be trained in the basic orientations rather than only as a "Foundry Technician," but generally qualified this by outlining a background which would be taught in either a metallurgical technician or electronic technician course. A few, however, were interested in mechanical engineering, and one stressed a need for electro-mechanical technology. In all, about 65 metallurgical technicians were directly employed in the industry; and about 70 technicians in other orientations. These were about evenly divided between mechanical (mostly on industrial engineering applications), quality control and lab technicians (these, again, seemed to have a chemical or metallurgical background), and electrical, electronic or electro-mechanical orientation. This, however, does not completely represent the demands of the industry. Much of the technician work done for captive foundries is performed in the engineering department and also does not show up in their foundry employment. In other cases a company ordering castings from a jobbing foundry has technicians working on specifications, and some foundries use engineering consulting services and contract testing laboratories. As a result of these factors, not all of the technicians employed in production of metal castings show up in the employment of these firms. In general, increased demand for technicians is anticipated by the industry. Forecasts for the most significant increases were for quality control applications and electronics. This industry, however, represents only a relatively small portion of the overall demand of the economy for such training.

d) Welding trades. Outside of maintenance welders, most welding in this industry is found in casting repair. At present, this industry uses about 250 welders, up to 100 flame cutters and up to 50 arc cutters. Demands for improved quality by customers, better sand control, melting, and pouring methods, and mold design are resulting in considerable decrease in casting repair. It is disappearing in non-ferrous and smaller malleable iron castings. Most casting repair remains in steel and, to a lesser extent, in large gray iron castings. It is expected that use of welders to repair castings will decline; also that the trend toward using gas shielded welding methods (mostly $CO_2$) instead of conventional arc will continue. In all probability some welding repair of large iron and steel castings will continue, but there will be less of it.

e) Crane and heavy equipment operators. About 125 are used in the industry. No significant changes other than growth with the industry are foreseen. Every one wants to hire experienced or trained operators, but vocational training is not possible due to the size and cost of equipment necessary.

f) Heat treaters. About 50 are directly employed, but this is a poor indicator of the industry's demand for the trade. Companies which have captive foundries sometimes have their own heat treating shop. Sometimes customers prefer to do their own heat treating. Much is done by heat treat jobbing shops. Skill levels in this field also vary. Few of the heat treaters found in this industry are comparable to the old tradesmen in the jobbing shops. Increased production of casting will, of course, increase need for heat treating. But the extent of this change cannot be gauged by studying only the metal casting industry.

g) Material support occupations. This includes stock men, shipping men, tool and pattern storage. About 75 persons well versed in knowledge of systems and procedures are engaged in this industry, but this again is not a valid indicator of the effect of the industry on the occupations involved. Must of this work is done in the office of some firms, in other cases by other departments of firms operating captive foundries, and some is now done by computers. The effect this industry has on overall demand in our economy is relatively small.

h) Machine trades. This category covers three basic classes of workers.

(1) Top grade machinists. Less than 30 directly employed in this

industry, usually in support of maintenance or tool and patternmaking operations.

(2) Machine tool set-up men and set-up operators. These are found in die, permanent mold and centrifugal casting establishments (and one foundry which manufactures some products), many of which produce finished and mechanical castings for their customers. About 230 operators with set-up skills are to be found in this industry.

(3) Machine tool operators. Some of the establishments mentioned above have set up the machines for other workers who only operate the machine. About 220 such people were employed.

The impact of this industry on the overall demand for machine trades is relatively small. However, the number of vacancies they reported and persistence of demand indicates that a need exists throughout the economy. This industry, by itself, cannot forecast future demands or trends in machine trades.

i) Other occupations. Over 400 persons are employed in a scattering of other occupations not peculiar to this industry, such as various construction trades (pipe-fitters, carpenters, sheet metal workers, structural steel workers, to name the most important), automotive and industrial truck mechanics, metal finishers, trim or forming press set-up men, conveyor operators, flask carpenters and metal fabricators. In general, these are trades which are found in some casting establishments, but are contracted for by most of them. In all cases, this industry does not have a significant impact on the overall demand by our economy for such trades, and the number actually employed does not reflect the entire demand of the industry. Trends in such trades must be covered by an overall study.

3) Occupations which are inter-industry in character. The effect of this industry (or any single industry) on occupations found throughout the economy tends to be negligible since one industry's share of such occupations represents but a small percentage of the whole demand. Therefore, no information of significance can be gained by making an intensive study of such occupations. For this reason, "administrative, office and overhead employment" was simply segregated and reported as one unit in this study. Some vocational courses in management and supervision might be used by this industry. But this would probably be best suited for tuition-refund programs for persons already employed.

## INVENTORY AND PROJECTIONS OF OCCUPATIONS PECULIAR TO THE METAL CASTING INDUSTRY IN THE MILWAUKEE S.M.S.A.

| OCCUPATION | 1967 | EXPECTED TRENDS<br>1967 to 1970 | <br>1970 to 1972 |
|---|---|---|---|
| Molders, Skilled (Loose Pattern-Bench, Floor & Pit) | 175 | Static | Static |
| Machine Molders (All methods, as squeeze, roll-over & sand slinger) | 770 | Increase up to 10% | Increase up to 6% |
| Coremakers, Skilled (Hand, Bench & Floor) | 200 | Static | Static |
| Coremakers, Machine (All methods, including feeders or automatic machines) | 350 | Increase up to 5% | Increase up to 3% |
| Die Casters - Skilled (Able to set-up Die Casting machines) | 80 | Increase 5 to 10% | Increase up to 5% |
| Die Casters - Semi Skilled (and no-set up; operators only) | 310 | Increase up to 5% | Increase up to 3% |
| Permanent Mold Casters-Skilled (set-up dies) | 15 | Increase 10%+ | Increase 5%+ |
| Permanent Mold Casters-Semi-Skilled (no set-up of dies) | 90 | Increase 10%+ | Increase 5%+ |
| Centrifugal Casters (All Skill Levels) | 65 | Increase 10%+ | Increase 5%+ |
| Smelters (Cupola & Coke Furnaces) | 40 | Decrease to 10% | Decrease to 5% |
| Melters (other furnaces) | 225 | Static | Static |
| General Foundry Labor (Entry positions & those filled by upgrading entry workers) | 6600 | Static or Decrease to 5% | Static or Decrease to 3% |

# APPENDIX F

## INDUSTRY-BY-OCCUPATION MATRIX - SUPPLEMENTARY MATERIAL

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## APPENDIX F

### Appendix F-1

### Procedure for Adjusting Wage & Salary Data to Provide for Addition of Counties to the Milwaukee S.M.S.A.

A number of approaches to making these adjustments were considered, but were discarded as unsatisfactory. The method settled upon, and regarded as at least reasonably satisfactory, made use of the following data: (1) Unpublished wage and salary employment figures by industry, on file at the State Bureau of Reports and Analysis, for the three-county Milwaukee S.M.S.A. (Milwaukee, Waukesha and Ozaukee Counties) for March 1963, and for the four-county S.M.S.A. (Milwaukee, Waukesha, Ozaukee and Washington Counties) for March 1967; and (2) wage and salary employment by industry for the old makeup of the S.M.S.A. (Milwaukee and Waukesha, only) for March 1963, and for the three counties (Milwaukee, Waukesha and Ozaukee) for March 1967. March figures were chosen since comparable figures for the old and new S.M.S.A. in 1963 and 1967 weren't available on an annual average basis.

The first step in the adjustment process was to establish ratios of private wage and salary employment by individual industries for the expanded three-county S.M.S.A. in March 1963 to employment for the old two-county S.M.S.A. in March 1963. Then, ratios of four-county to three-county employment were established for the period of March 1967. For example: for industry S.I.C. code 24, private wage and salary employment in March 1963 for the three-county S.M.S.A. was divided by private wage and salary employment for the old two-county S.M.S.A.

$$\text{SIC } 24 \qquad \frac{1224}{1110} = 1.103$$

_If_ we assume a constant proportion of SIC 24 wage and salary employment of the three-county S.M.S.A. to the two-county S.M.S.A. for the years 1958 through 1962, we can multiply SIC 24 wage and salary employment for March 1958, 1959, 1960, 1961 and 1962 by the factor, or multiplicant (1.103), in order to derive adjusted employment figures covering the three counties.

The reasonableness of this assumption was tested by establishing ratios of three-county to two-county employment using figures secured from the U.C. tapes of covered employment for individual industries in selected years prior to 1963. (For example, ratios might be established for industry 24 for March of 1958-59-60). If the ratios of three-county to two-county employment varied significantly among the years selected, these ratios--based on the UC tape figures--were used in making the final adjustment rather than the constant ratio cited above (1.103 for industry 24). For most industries, it was found that the ratios based on UC tapes remained ralatively constant for the years 1958 through 1962; therefore, to secure the three-county data for the years 1958 through 1962 it was possible in most instances to use the constant ratio derived from March 1963 wage and salary employment by industry for the three counties divided by the March 1963 figures for the two counties.

The same procedure was followed in order to add Washington County to the three-county S.M.S.A. data. The ratio of four-county wage and salary employment to three-county data was established for March 1967, the year the fourth county was added. Again, comparisons were made of ratios derived from UC tape covered employment to determine which ratios were to be used. In the case of the adjustments for Washington County, the UC-tape based ratios were used for a number of industries.

Finally, having determined the ratios to be used for each industry, the three-county to two-county ratios were factored against the two-county annual averages for 1958 through 1962 to derive three-county annual averages for those years. (The BLS methodology uses annual averages rather than March figures.) Then, the four-county to three-county ratios for March 1967 (or specific UC-tape based ratios, where advisable) were factored against the three-county annual averages for each year from 1958 through 1966 to arrive at the four-county annual averages for those years. This resulted in a consistent series of annual average private wage and salary data for each year of the ten-year period used in the time series.

## APPENDIX F
(F-2)

Problems with using regression analysis to project employment by industry, especially for the relatively smaller SMSAs

The standard error of estimate (standard deviation of regression) is our measure of how well the estimated values along any trend or regression line agree with the actual value (employment by industry) observed. The coefficient is stated in the same units as the dependent variable (wage and salary employment by industry.)

In attempting to determine which of a number of regression models could and should be used to project employment by industry to the target year of 1975, the accuracy or reliability of the estimate (actual projection) as measured by the standard error of estimate is of crucial concern. However, problems arise in that the standard error of estimate for the year 1975 may not measure the actual range of errors in the projection (wage and salary employment by industry.) The standard error of estimate for the target year 1975 depends in part on whether or not the series of employment by industry or the universe of employment by industry is stable over time. If basic trends in the factors determining employment change, the requirement for a consistent or stable universe would not be met. Any number of visits with major durable manufacturing industry representatives in the Milwaukee S.M.S.A. led us to believe that past relationships between factors affecting output and employment within specific industries need not continue into the future for the Milwaukee S.M.S.A. Although the potential sales and growth patterns of many major firms based within the Milwaukee S.M.S.A. may continue as they have in the recent past, there is some question as to whether the relationshep of these factors as well as others to employment within the confines of the Milwaukee S.M.S.A. will continue.

A number of major employer representatives have confessed plans to expand or transfer facilities outside the radius of the S.M.S.A. The relatively tight labor market in part explains this movement. In many instances the probable distances of the moves make it unlikely that the Milwaukee S.M.S.A. will be expanded to include these areas in the future. The projections of employment by industry to 1975 may include estimates of a number of people employed within these industries in 1975 outside of the S.M.S.A. and therefore, perhaps to some extent, outside the concern or purview of vocational institutions located within the presently defined S.M.S.A. It is, of course, realized that the Milwaukee vocational institutions intend to train in part for a national, regional, and state market as well as for the S.M.S.A. The point that should be emphasized, however, is that the projections of occupational needs are being made for a well defined standard metropolitan statistical area. In presenting these projections to vocational educators in the area, we are telling them that this will be the need in your immediate surroundings. They then can add whatever information they have on the needs they should and most likely will train for outside of their immediate geographical area. If they are unable to relate occupational need projections for the areas immediately surrounding them to the overall needs that they should train for, the degree of accuracy and reliability of the occupational projections that the analyst is attempting to secure by use of BLS Occupation-by-Industry Matrix becomes superfluous, if not meaningless. At times, an almost endless number of refinements or adjustments have to be made to the various component segments of the BLS projection methodology. This includes adjustments made in establishing a time series for an adequate breakout in industry detail, adjustments made in the series to account for a changing S.M.S.A. over time, adjustments made to include all other and government workers to wage & salary employment figures by detailed industry breakouts, and consultations with any number of industry experts in order to justify the use of any one regression or any other model to project future employment needs.

In addition to considering the standard error of estimate in determining which regression or model best measures the past relationship of employment by industry to all other factors affecting employment, it was also necessary to consider (1) the coefficient of determination and the correlation coefficient, and (2) the regression coefficients.

The goodness of fit of any regression line relating employment or change in employment to all other factors or changes in all other factors affecting employment for any one industry is measured by the correlation coefficient (the square root of $r^2$, the coefficient of determination). The coefficient of determination ($r^2$) statistically is designed to indicate what proportion of the variance of values for the dependent variable (employment by industry, in our case) is explained, or in a sense caused, by the variation in the independent factors affecting employment by industry (represented by time or national employment.) There are error limitations which could limit the use or interpretation of a high coefficient of determination or a high coefficient of correlation and therefore the use of a regression line which seems to have a good fit.

Another important consideration in determining which regression model might be used to project wage and salary employment by industry into 1975 is the regression coefficient.

The wage and salary employment figures used in our time series are based on sampling. These are blown up to the universe of employment. The actual percentage of the universe or total employment covered in any Current Employment Statistic series varies from a high of 90 percent, where some durable manufacturing industry figures are based on the reports of employers covering 90 percent of the employment in that industry, to other industries in nonmanufacturing, e.g. service industries, where the percentage is 40 percent or lower. Analysts might encounter additional problems in making accurate employment projections by industry for an area such as Milwaukee when and if special four-digit SIC breakouts of manufacturing industries and three-digit SIC breakouts of nonmanufacturing industries are made available for purposes of establishing a finer detailed time series than the present unpublished Current Employment Statistics breakouts allow. These more detailed breakouts of wage and salary employment are based on a smaller sample of firms for each industry than are the less detailed breakout. Consequently, the problem of using regression analysis for projecting employment into the future becomes even more involved. Before deciding upon the one regression line that may predict best, we must consider with some degree of statistical confidence the possible range or limits to the numbers of people that are likely to be employed within the industry in 1975.

APPENDIX F
(F-2)

One of the considerations in selecting a regression model to project wage and salary employment by industry for 1975 was the likely variability of the projection selected. In using a 95 percent confidence interval for the projection chosen (plus or minus two standard errors of estimate) we attempted to select the model which met all other tests of statistical reliability and at the same time afforded us the least variation. However, given the fact that the "true value" of the regression coefficients and of the standard error of estimate is based on an analysis of the universe or entire population (employment), the standard error of estimate used with which to measure the actual range or confidence of the projection is only an estimate of the true standard error of estimate.

## APPENDIX F

### Appendix F-3

### Method for Estimating Employment by Occupation for the Milwaukee S.M.S.A. in 1960.

Unadjusted estimates of employment by occupation were secured from Table 121 of the 1960 decennial Census for the Milwaukee S.M.S.A. First, adjustments were made by prorating the total employment for "Occupation Not Reported" to those occupations plotted into the final projection program that were secured from the decennial Census. This included 160 occupations. 1975 projections for an additional 31 occupational classifications were secured by simply multiplying national staffing patterns by industry by the appropriate industry employment for 1975. If the wage and salary occupational employment in Table 121 of any one occupation (e.g., Technicians, other , 1699) covered six-tenths of one percent of total employment, we made the simple, and not always justified, assumption that six-tenths of one percent of total employment of "Occupation Not Reported" belonged to occupational classification 1699.

The second adjustment made involved determining the ratio of the total employment concept [1] to total employment secured from the 1960 decennial Census. We then multiplied this ratio by the above estimates of 1960 employment by occupation (data from Table 121 adjusted by prorating "Occupation Not Reported" data) for all occupations for which projections were made. Both unadjusted and adjusted 1960 estimates of employment by occupation for the two-county S.M.S.A. are included in the printouts(in Appendix F-8-A .) The adjusted estimates of employment are in brackets in the printouts. Both unadjusted and adjusted projections of employment by occupation for 1975 covering the four-county S.M.S.A. are included, also.

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[1] Wage and salary employment estimates adjusted for dual job holders, plus estimates of self-employed and unpaid family workers, plus estimates of government employment by industry, plus an estimate for unpaid absences (the number of people classified as employed but excluded from Current Employment Statistics because they are not on payrolls.)

APPENDIX F

Appendix F-4

## Factors to be Considered in Differentiating between Occupational Patterns of Particular Industries in Milwaukee S.M.S.A. vs. the National and Possibly State-Wide Patterns. Included is a Discussion of Some Factors that Affect the Growth Patterns of Milwaukee Industries Differently than would be Expected of the Growth Patterns of Industries on the National and even State Level.

In the present, as in the past, durable manufacturing industries in Milwaukee are made up mainly of manufacturing branches vs. administrative offices (headquarters). This, of course, causes the occupational patterns within a number of durable manufacturing industries in the Milwaukee area to be somewhat different than for the nation or perhaps a state. At present, two large Milwaukee firms are in the process of merging with other firms. Mergers are likely to have some effect on the occupational patterns (or occupational mix) of management and possibly of technical or engineering occupations.

Milwaukee tends to be a manufacturer of durable and capital goods. The significance of this is that Milwaukee specializes in the manufacture of large machinery, capital goods, and short run special manufacture. Many Milwaukee firms within these industries manufacture items that similar industries elsewhere would not find profitable to manufacture. Consequently, the staffing patterns would be somewhat different for this industry in Milwaukee than in the nation as a whole.

Short run manufacture involves the manufacture of complex components. This requires a generally skilled labor force. As a result, the Milwaukee area contains a higher percentage of skilled trades, tool and die makers, machinists, metal fabricators, and welder fitters than one would find in other labor markets such as Detroit. Detroit is an example of an S.M.S.A. in which long run production prevails in some industries similar to Milwaukee's; a few workers set up machinery, mainly of an automatic type, and a large percentage of workers merely feed and tend the machines. The labor force within these industries in Detroit is not as highly skilled as in the Milwaukee S.M.S.A. For this reason, Milwaukee may have a higher proportion of highly skilled workers within a specific durable manufacturing industry than may exist elsewhere.

Milwaukee's specialization in durable goods, especially nonelectrical and electrical machinery industries, has an effect on other industries in the area as well. Wage scales in durable goods are higher than they are in soft goods or nondurable industries. As a result, some soft goods or nondurable industries have virtually been driven out of the Milwaukee area. The textile industry (knitting) has been significantly reduced in Milwaukee. Garment industry employment is down and has been declining for some years. The soft goods industries include tannery, shoes and leather products; and these industries, also, are not growing at national or perhaps state rates. Food processing employment trends have also changed in Milwaukee. Meat packing has declined, partly due to a national trend in which the meat packing industry is moving westward.

Milwaukee had a high skill immigration and therefore tended to be a trade oriented community. Many of the Milwaukee firms to this day manufacture difficult-to-make components. One local firm, which employs some 2600 persons, is almost a glorified machine shop, specializing in the manufacture of components for large construction, mining, and related machinery used in small rather than large lots.

The electrical and electronic goods industry has grown significantly in Milwaukee. However, as stated elsewhere, there is a danger of basing future employment estimates on past trends or even on past ratios of local to national employment growth rates since some Milwaukee companies are expanding their facilities outside of the Milwaukee S.M.S.A.

The specialization of some Milwaukee industries in highly skilled, short run work may affect growth patterns of these industries and the change in occupational mix in yet another way. Wherever short run manufacturing prevails, a tendency toward preserving older techniques and processes also prevails. Long run manufacturing, on the other hand, tends to promote advanced forms of technology. Accordingly, for a number of manufacturing industries, the occupational patterns for the Milwaukee S.M.S.A. might be different from occupational patterns that exist elsewhere.

The foundry industry in Milwaukee has not advanced as repidly as foundries elsewhere in adopting newer technological production techniques.

Employment of the transportation equipment industry, especially in the manufacture of automobiles,within the Milwaukee S.M.S.A. has been less stable or varies more than for employment in the auto industry throughout the nation.

In other industries, such as instrument manufacturing (electrical instruments), defense expenditure policy plays a critical role on local employment. The Defense Department affords contracts to areas of relatively high unemployment. These policies obviously affect growth rates of such industries in the Milwaukee S.M.S.A. where the unemployment rate has been consistently lower than the national average for a number of years. One relatively large electronics firm in the Milwaukee S.M.S.A. depends on defense contracts. Therefore, employment trends in this industry in the Milwaukee area may differ considerably from trends in the nation.

# APPENDIX F

## Appendix F-5

## Comments Concerning Industry List, BLS Occupation-by-Industry Matrix

From the standpoint of presenting occupational information, the BLS Industry Structure represents something of an improvement over the S.I.C. classifications. This is so because the BLS does rearrange the S.I.C. into a more homogeneous structure of industrial activities (vs. end product).

Ideally, the most specific level of industry detail should be used if the industry structure is to be of use for the purpose of projecting occupational needs. The broader groupings tend to contain many dissimilar activities. (On the other hand, of course, the advantages of the most specific level of detail must be weighed against such other considerations as cost, time involved and potential accuracy of projections of employment for the most specific detail of industry classifications.)

Even as structured, the industry organization contains some groupings of dissimilar activities which could result in entirely different occupational patterns from community to community. "Blowing up" occupational totals taken from a limited sampling of establishments could result in a distorted picture because the base of sampling is not homogeneous. Applying national trends to local establishments in such industries could also be misleading because the activity in that community may be in an unrelated segment of that "industry" which is undergoing a contrasting change.

The following are examples of industry groupings which contain dissimilar activities:

SIC 25, Furniture and Fixtures. The Furniture Industry includes establishments similar in knowledge of designs, styling, and logistics of marketing.

However, from an occupational standpoint and from standpoints of materials used and processes employed, it is a collection of segments of several industries; e.g., Woodworking (Wood Furniture), Fabricated Metals (Metal Furniture), to a smaller extent the Plastics Products Industry (Laminated Plastic Furnitures--Formica Table and Counter Tops), and some activities of the Reed and Rattan Industry (Reed and Rattan Furniture).

It is easy to see how an estimated increase in the projection of employment in this industry, based upon estimated increase in metal and plastic furniture manufacture, can be misapplied to the projections of occupations which are essentially based upon production of wood furniture in a given local community. We can also see how a matrix of this industry would include trades in all activities; and if applied to a community engaged in only one branch of this industry (let us say a woodworking community), we would find a lot of metalworking occupations used in shaping wood furniture.

Codes under "Other Primary Metal Industries." Here again we have a mixture of industrial (and occupational) activities. Included here are such contrasting activities as Wire Drawing, Fabricated Steel Wire Products, Fabricated Pipe-Extrusion Mills, Rolling Mills, Foundries, Forge Shops, Heat Treaters, Powder Metallurgy, and Ferrous and Nonferrour Nails and Tacks. The trades and skills involved are quite different. In the Milwaukee area, a greater-than-average percent consists of Forging, while Rolling Mills are non-existent. Applying a nationwide forecast based in good part on Rolling Mill activity would misfire when applied to Milwaukee where there is almost no Rolling and where Foundry and Forge predominate in this group. Therefore, it follows that the change factor from 1960 to 1975 for a particular occupation based on national staffing patterns within an industry may be misleading in such cases. The different activities or detailed occupations existing within a local industry, as contrasted with its national or state counterpart, may not be growing or declining at the same rate.

Codes under "Primary Nonferrous Metals." Includes a group somewhat similar to the above, but applied to nonferrous metals. In Milwaukee, the application of a national average might not distort as much as in the ferrous metal industries; however, Milwaukee has no ore refiners, and the one big company in this particular field in Milwaukee produces many products not included in this code.

All groups covering Fabricated Metal Products, Machinery, and Transportation have two inherent problems:

(1) Many multiple-product companies are reported under one SIC code although less than 50 percent of their activities apply to that classification. A good example is the Briggs & Stratton Company which is classified as a manufacturer of combustion engines, but is also a leader in manufacture of locks and keys for the auto industry, an activity which has a completely different occupational pattern.

(2) These groups are based upon products, but any given product can be made in different ways, from different materials, by different methods. Under Shipbuilding, for example, one includes everything from the construction of plastic canoes to huge freighters. (Workers in the latter are actually Construction Workers.)

SIC 39, Miscellaneous Manufacturing. This category is meaningless. For example, if we examine the conglomerations listed in this group, we will see how it could be misapplied to an area such as the Janesville S.M.S.A. where this industrial classification is dominated by a major manufacturer of pens. If we apply the national matrix, this manufacturer will have everything in his employment from cutting diamonds to making wigs for dolls.

Trade. There are a number of "other" and "N.E.C." classifications which are catch-alls, though it is difficult to pinpoint areas where significant distortions may result. The most likely distortion in the Milwaukee area may result from 53 codes; J.C. Penney, primarily a mail order operation, may distort the Milwaukee total as compared to the national total in which retailing occupations would prevail.

Services. Note "All Other Personal Services" and "Other Miscellaneous Business Services." Both are such conglomerations of heterogeneous activities embracing occupational patterns vastly different from each other that it is difficult to assess whether the net occupational matrixes would differ from one community to another.

Appendix F-6

Comments on Census Occupational List: Considerations to be examined if data secured by use of BLS methodology is to be used for purposes of assisting vocational educators.

The BLS Occupation-by-Industry Matrix methodology derives its basic occupational designations from U.S. Census listings. However, there are a number of aspects of the Census occupational list which must be considered if one intends to relate data which is derived from the BLS methodology to the needs of vocational program planners. In some cases, the Census classifications are good and can be used for the purpose of relating occupational information to training programs; in others, it will be impossible to draw any meaningful relationship to training or to any basic knowledge area.

In general, only the most definitive titles will have any value since the basic divisions are too inclusive. To be more precise, the following divisions and specific titles will have little value:

1. All of the "Other" and "N.E.C." titles.
2. The following specific titles --

Code #

1280 - Technicians, Medical & Dental - This title combines many different basic training areas. For example, Orthopedic Technicians and Dental Lab Technicians are primarily craftsmen, while others are various categories of scientific technicians.

1300 - Teachers - Elementary and Secondary are probably all right as classifications; but Vocational and College Teachers are really related to their professional discipline (or trade) rather than to "teaching."

1935 - Designers, exc. design draftsmen - This obviously requires further definition.

2200 - Ship Pilots and Engineers are classified with Officers (managerial) instead of having a separate classification under #5700, Transportation Craftsmen.

4000 - Sales Workers - This is a very poor breakdown. Sales Clerks and Technical Salesmen are all grouped together.

5000 - Craftsmen, Foremen and Kindred - Many titles under this category are split by trade union jurisdiction and, consequently, by different apprenticeship programs.

5100 - Construction Craftsmen - This is a meaningless classification for training purposes.

5200 - Foremen, N.E.C. - Many Foremen are identified with their trade, craft, or activity.

5310 - Machinists, All-Around - There is likely to be considerable confusion here, and in 5315 - Other Skilled Machining Occ., and in 6340 - Machine Tool Operators, Class B. If there are no very clear definitions given, we will only get "numbers" in these categories.

5325 - Boilermakers - This is a term, not an occupation, and is obsolete by over 30 years. Most persons known as "Boilermakers" are workers in any of various construction trades under the jurisdiction of the Boilermakers Union. The term is also applied to Metal Fabricators (the original meaning) and to Assemblers in package-type boiler manufacturing plants.

5350 - Molders, Metal (except Coremakers) - This obviously combines different orientations and skills.

5390 - Toolmakers, Diemakers, Setters -"Tool Setters" has many meanings, and often the term applies to workers who do not belong in a class with Toolmakers.

5710 - Line and Servicemen, telephone - Includes many different occupations, some of which are entirely different in training.

5980 - Inspectors, other - This takes in a vast amount of territory; consider, for example, a Federal Meat Inspector, a Casting Inspector in a foundry, and a Sewer Inspector. Many curriculums pertain to this classification; consequently, it would be most difficult for training institutions to make sense out of an employment projection covering this group.

6310, 6320 - Assemblers, Metalworking, Classes A and B - Does this mean Mechanical or Structural Assemblers? What is Class A and Class B?

6950 - Mine Operators, Laborers, N.E.C. - This seems to group Operating Engineers with Laborers simply because they share the same environment.

6960 - Meat Cutters, exc. meat packing - Granted, there is a difference between retail and restaurant Meat Cutters and skilled packinghouse workers. However, the latter group is clearly more related to the former than to the wire weavers, tanners, chemical blenders and felting machine operators with which it would presently be included (in #6999, Operatives & Kindred Workers, N.E.C.)

Finally, it should be emphasized that none of the "Other" classifications can be related to training programs or to any category of occupational knowledge.

We recognize that the Census occupational listing system is a very good system when applied to certain of the purposes for which it was intended. However, it presents many difficulties when we try to relate occupational employment projections, based on Census occupational classifications, to occupational training curriculums.

## Appendix F-7 DATA PROCESSING PROGRAMS

### A. Regression and Add List Sort Programs and User Manuals Created for PROJECT VISION

PROJECT VISION work required extensive statistical computation at several stages. However, to provide the needed statistics on a demand basis in each instance would have required extensive single purpose programming, placing demands on systems and data processing personnel beyond their capacity to meet. For this reason, it was decided that general statistical programs should be implemented and that user manuals should be written for these programs to reduce VISION's dependence on systems and data processing personnel.

To meet the needs of VISION, two programs were implemented: the Add List Sort Program and A Multiple Linear Regression Program. The first program, ADLISO, was created to enable workers in PROJECT VISION to determine whether or not there was a statistically meaningful difference between response rates of firms receiving different skill survey questionnaires requesting manpower projections. The second, REGER I, was implemented to enable VISION to carry out its BLS Method A study in which industry employment projections are required for 1975 by SIC. In order to acquire the 1975 figures, multiple linear regression models were used on historical employment data of selected SIC groups.

The Add List Sort Program enabled VISION's statisticians to sort data and to obtain general statistics on variables. The program, written to handle up to ten variables and 800 observations, can be made to sort observations and then provide means, totals, standard deviations, ranges and counts on each of the variables in the population and in each sorted sub-set.

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A Multiple Linear Regression Program was acquired from IBM and revised to compute the Durbin-Watson Statistic, allow free input formating of data, and provide for input data transformations. The program, otherwise unchanged, includes all data related to multiple linear regressions.

Manuals were written for the two programs, ADLISO and REGER I. The objective in preparing the manuals was to reduce user statisticians' dependence upon systems and data processing personnel through information on how to control a standard general program. The result, of course, was a reduction of consumption of systems and data processing personnel time and an increased familiarity on the part of the user with the machine and with its ability to derive statistics from input data.

The idea for the manuals was acquired from university computer centers' normal practice of creating manuals for standard programs which then enable the general university community to use the programs and the machines to implement their requests. The user manuals that were created for PROJECT VISION, however, go beyond some of the standard procedures and information that is presented in university user manuals. It contains information on cost, when to use a program, and definition of some of the statistical terms that are created from the data that the user supplies. It is meant by this procedure to create an awareness in the user's mind of the ability of the machine to produce data and also to enable him to know when to use it and how to use it.

## B. BLS Method A Computer Costs -- Development and Normal Running Costs

An IBM system 360 model 30 processor was employed to derive 1975 occupational employment projections for the Milwaukee S.M.S.A. using BLS Occupation-by-Industry Matrix Method A. The following is a breakdown of costs incurred through use of that system. In a concluding section there is a comparison of the development cost (of Milwaukee area projections for PROJECT VISION) with the expected cost of a normal run, or "second use", of the same system.

The statements of cost are broken down according to the three areas for which the computer was used. The first functional use was to project 1975 industry employment via Linear Regression techniques. The second function was decoding a BLS industry-occupational matrix tape.* The third function was running of the BLS Method A to produce the 1975 occupational projections.

### 1. Regressions

To project 1975 industry employment for the Milwaukee area, the S/360 was used to prepare regressions on historical data. Approximately 15 regressions were run for each industry to determine the best fit that could be achieved for predictive purposes. (See section on regression models in Chapter VIII)

The cost of the regressions includes overhead of debugging a standard regression program modified to produce the Durbin-Watson statistic and allow for data transfigurations. (The D-W was needed to determine whether time serial correlation existed, and the transformations were necessary to obtain logs, squares, square roots, and ratios.)

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*We used the "Himmelbauer Matrix." This transposed tape, more suitable for Method A processing. was coded in binary 7094 floating point representation. (Reference: Occupational Manpower Requirements: Projections for the State of Illinois in 1975, July 1968, Prof. William Himmelbauer, University of Chicago Graduate School of Business.)

There were 88 industry designations and approximately 15 regressions per industry resulting in 1320 regressions. Average cost per regression, 17.6 cents.

Total dollar cost of regression runs, rounded to nearest dollar, was $232.00.

2. Tape Decoding

To use the Himmelbauer occupational matrix tape, floating point binary 7094 representation numbers had to be converted to EBCDIC for use with our 360 system FORTRAN.

The conversion cost to the nearest dollar, $30.00.

3. Method A

The methodology outlined by the BLS was programmed in FORTRAN to run on S/360. The cost given below includes the run that produced occupational projections plus extensive debugging and trial runs.

Method A running cost to the nearest dollar, $124.00

Cost Comparison — VISION BLS Matrix Method A vs. a run for the State.

PROJECT VISION's experiences with occupational forecasting using BLS Method A have provided the Wisconsin State Employment Service with programs and knowledge of the methodology.

To the end of putting these resources to use, the WSES is presently undertaking a Method A forecast for 1975 state occupational needs. The following costs may reasonably be expected:

| | Second Use | PROJECT VISION |
|---|---|---|
| Regression | \$160.00 | \$232.00 |
| Tape Conversion | --- | 30.00 |
| Method A | 10.00 | 124.00* |

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*Due to difficulty with the Himmelbauer tape, the Method A program needed extensive revision after it had been tested out. Of the \$124.00 cost, only \$10.00 was spent for the _final_ production run.

APPENDIX F-8

## COMPLETE PROJECTION DATA

NOTES

### F-8 A. Occupational Employment Projections, Milwaukee SMSA

(Column 7 - Occupational Projections for 1975)

Bracketed figures for both Cols. 5 and 7 allow for adjustments made to 1960 Census occupational data. Adjustments involved a distribution of the " Occupation Not Reported" classification among other occupational classifications, as described in Appendix F-3.

### F-8 B. Industry-wide Employment Projections, Milwaukee SMSA

Column 3 - Estimated employment by industry for the 1960 2-county SMSA - full employment concept.

Column 4 - Estimated employment by industry in 1975 for the 4-county SMSA as constituted at present.

### F-8 C. Sources of Projected Occupational Growth, Milwaukee SMSA

Columns 3 and 4- Estimated employment for 1960 and 1975, respectively, based on BLS Matrix occupational staffing patterns and estimates of local industry employment. (These estimates do not refer to the occupational projections based on Method A.)

Column 5 -Estimates of changes in occupational employment from the 2-county Milwaukee SMSA in 1960 to the 4-county SMSA as constituted at present for 1975.

Column 6 -Estimates of change in occupational employment caused by changes in total employment by industry. Secured by holding 1960 national occupational staffing patterns by appropriate industry constant for 1960 and 1975 and multiplying these 1960 patterns by appropriate industry employment for both the base year of 1960 and the target year of 1975.

Column 7 -Estimates of change in employment caused by changes in occupational patterns.

Estimates in both Columns 6 and 7 also reflect the changes in the geographic scope of the Milwaukee SMSA.

Caution must be exercised in interpreting Column 7. Estimates in this column give some indication of how shifts in staffing patterns affect employment by occupation, assuming that national staffing patterns are accurate for the Milwaukee SMSA.

APPENDIX F (F-8)

F-8 A

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 BASED ON BLS METHOD A.

| ① | ② | ③ | ④ | ⑤ | | ⑥ | ⑦ | |
|---|---|---|---|---|---|---|---|---|
| OCCUPATIONAL DESCRIPTION | TAPE CODE | RATIO OF EMPLOYMENT 75'/60'COL5/3 | ESTIMATED EMPLOYMENT 1960 BASED ON BLS MATRIX & IND.EMP.60' | ESTIMATED EMPLOYMENT 1960 BASED ON DECENNIAL CENSUS | | ESTIMATED EMPLOYMENT 1975 BASED ON BLS MATRIX & IND.EMP.75' | ESTIMATED EMPLOYMEN 1975 BASED ON BLS METHOD -A- | |
| ENGINEERS TECH | 1100 | 1.53544 | 9478 | 8945 | (9373) | 14553 | 13734 | (14388) |
| ENGR AREONAUTICAL | 1110 | 0.90647 | 491 | 33 | (33) | 445 | 29 | (30) |
| ENGINEER CHEMICAL | 1120 | 1.33770 | 226 | 165 | (165) | 303 | 220 | (221) |
| ENGINEER CIVIL | 1130 | 1.64721 | 1024 | 1007 | (1052) | 1688 | 1658 | (1733) |
| ENGINEERS ELECTRIC | 1140 | 1.47388 | 2515 | 2194 | (2307) | 3707 | 3233 | (3400) |
| ENGINEER INDUST | 1150 | 1.72591 | 1105 | 1130 | (1175) | 1907 | 1950 | (2028) |
| ENGR MECHANICAL | 1160 | 1.41883 | 2229 | 2072 | (2162) | 3163 | 2939 | (3068) |
| ENGR METALLURGICAL | 1170 | 1.67484 | 262 | 320 | (343) | 439 | 535 | (574) |
| ENGINEER MINING | 1180 | 0.97236 | 20 | 8 | (8) | 19 | 7 | (8) |
| ENGINEERS, SALES | 1190 | | Include in tape códe # 1199 | | | | | |
| OTR ENGR, TECH | 1199 | 1.79634 | 1603 | 2016 | (2106) | 2879 | 3621 | (3782) |
| MED+OTR HEALTH WKR | 1200 | 1.80847 | 9686 | 9563 | (10014) | 17517 | 17294 | (18105) |
| DENTISTS | 1210 | 1.54376 | 663 | 761 | (806) | 1024 | 1174 | (1244) |
| DIETICIANS+NUTRITI | 1220 | 1.47195 | 179 | 186 | (186) | 264 | 273 | (274) |
| NURSES PROFESSIONL | 1230 | 1.85713 | 3737 | 4342 | (4545) | 6942 | 8063 | (8440) |
| OPTOMETRISTS | 1240 | 1.29186 | 128 | 133 | (133) | 165 | 171 | (172) |
| OSTEOPATHS | 1250 | 1.35840 | 100 | 8 | (8) | 135 | 10 | (11) |
| PHARMACISTS | 1260 | 0.98601 | 779 | 623 | (646) | 768 | 614 | (637) |
| PHYSICIANS+SURGEON | 1265 | 1.81702 | 1671 | 1572 | (1640) | 3037 | 2856 | (2980) |
| PSYCHOLOGISTS | 1270 | 2.21203 | 73 | 117 | (117) | 161 | 258 | (259) |
| TECH MED + DENTAL | 1280 | 3.04030 | 1057 | 1122 | (1167) | 3215 | 3411 | (3548) |
| VETERINARIANS | 1290 | 1.60356 | 19 | 52 | (52) | 31 | 83 | (83) |

APPENDIX F (F-8)

F8A

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 BASED ON BLS METHOD A.

| OCCUPATIONAL DESCRIPTION | TAPE CODE | RATIO OF EMPLOYMENT 75'/60'COLS/3 | ESTIMATED EMPLOYMENT 1960 BASED ON BLS MATRIX & IND.EMP.60' | ESTIMATED EMPLOYMENT 1960 BASED ON DECENNIAL CENSUS | ESTIMATED EMPLOYMENT 1975 BASED ON BLS MATRIX & IND.EMP.75' | ESTIMATED EMPLOYMEN 1975 BASED ON BLS METHOD -A- |
|---|---|---|---|---|---|---|
| OTR MED + HEALTH | 1299 | 1.38789 | 1275 | 647 (670) | 1770 | 897 (930) |
| TEACHERS | 1300 | 1.70060 | 10694 | 11237 (11778) | 23996 | 19109 (20034) |
| TEACH ELEMENTARY | 1310 | 1.33671 | 5104 | 6191 (6484) | 9001 | 8275 (8669) |
| TEACHERS SECONDARY | 1320 | 1.94320 | 3134 | 3056 (3191) | 8031 | 5938 (6200) |
| TEACHERS COLLEGE | 1330 | 2.33613 | 1062 | 1089 (1134) | 3277 | 2544 (2649) |
| TEACH OTR EXC COLL | 1399 | 2.00284 | 1394 | 901 (946) | 3687 | 1804 (1895) |
| NATURAL SCIENTISTS | 1400 | 1.72897 | 1359 | 673 (696) | 2350 | 1163 (1203) |
| CHEMISTS | 1410 | 1.66237 | 534 | 443 (466) | 887 | 736 (774) |
| AGRICULTURAL SCIEN | 1420 | 1.46978 | 115 | 67 (67) | 169 | 98 (98) |
| BIOLOGICAL SCIENT | 1430 | 2.06476 | 142 | 53 (53) | 293 | 109 (109) |
| GEOLOG + GEOPHYSIC | 1440 | 2.25582 | 40 | 8 (8) | 92 | 18 (18) |
| MATHEMATICIANS | 1450 | 1.94533 | 187 | 38 (38) | 364 | 73 (74) |
| PHYSICISTS | 1460 | 1.75275 | 213 | 52 (52) | 373 | 91 (91) |
| OTR NATURAL SCIENT | 1499 | 1.33530 | 125 | 12 (12) | 167 | 15 (16) |
| SOCIAL SCIENTISTS | 1500 | 1.53542 | 361 | 373 (395) | 554 | 573 (606) |
| ECONOMISTS | 1510 | 1.56472 | 148 | 130 (130) | 232 | 203 (203) |
| STATISTICIANS+ACT | 1520 | 1.45296 | 181 | 157 (157) | 263 | 228 (228) |
| OTR SOCIAL SCIENT | 1599 | 1.86873 | 31 | 86 (86) | 59 | 161 (161) |
| TECH EXC MED+DENT | 1600 | 1.70439 | 7383 | 6335 (6628) | 12583 | 10797 (11294) |
| DRAFTSMEN | 1610 | 1.41911 | 2921 | 3038 (3173) | 4145 | 4311 (4502) |
| SURVEYORS | 1620 | 1.94986 | 274 | 148 (148) | 534 | 288 (290) |
| AIR TRAFFIC CONTRO | 1630 | 1.05307 | 71 | 0 (0) | 75 | 0 (0) |

F 8A

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 BASED ON BLS METHOD A.

| OCCUPATIONAL DESCRIPTION | TAPE CODE | RATIO OF EMPLOYMENT 75'/60'COL5/3 | ESTIMATED EMPLOYMENT 1960 BASED ON BLS MATRIX & IND.EMP.60' | ESTIMATED EMPLOYMENT 1960 BASED ON DECENNIAL CENSUS | | ESTIMATED EMPLOYMENT 1975 BASED ON BLS MATRIX & IND.EMP.75' | ESTIMATED EMPLOYMEN 1975 BASED ON BLS METHOD -A- | |
|---|---|---|---|---|---|---|---|---|
| RADIO OPERATORS | 1640 | 1.46344 | 106 | 125 | (125) | 155 | 182 | (183) |
| TECH ELECT & ELECTR | 1650 | 0.0 | 0 | 0 | | 0 | 0 | |
| TECHNICAL, OTR ENG & PHYS SCI | 1660 | 0.0 | 0 | 0 | | 0 | 0 | |
| TECHNICIANS OTHER | 1699 | 1.91349 | 4009 | 3024 | (3159) | 7672 | 5785 | (6043) |
| OTR PROF TECH KIND | 1900 | 1.65682 | 15924 | 14623 | (15321) | 26384 | 24230 | (25387) |
| ACCOUNTANTS+AUDIT | 1910 | 1.48406 | 3465 | 3789 | (3969) | 5142 | 5623 | (5890) |
| AIRPLANE PILOTS | 1915 | 1.57833 | 111 | 54 | (54) | 175 | 85 | (85) |
| ARCHITECTS | 1920 | 1.60592 | 199 | 250 | (273) | 319 | 401 | (438) |
| CLERGYMEN | 1930 | 1.13908 | 1288 | 1033 | (1078) | 1467 | 1176 | (1228) |
| DESIGNERS | 1935 | 1.44823 | 624 | 671 | (694) | 905 | 971 | (1005) |
| EDITORS & REPORTERS | 1940 | 1.10295 | 920 | 629 | (652) | 1015 | 693 | (719) |
| LAWYERS & JUDGES | 1945 | 1.72817 | 1616 | 1739 | (1829) | 2794 | 3005 | (3160) |
| LIBRARIANS | 1950 | 1.93174 | 182 | 434 | (457) | 353 | 838 | (883) |
| PERSONNEL WORKERS | 1960 | 1.67590 | 855 | 814 | (859) | 1433 | 1364 | (1440) |
| PHOTOGRAPHERS | 1970 | 1.07831 | 402 | 385 | (408) | 434 | 415 | (440) |
| SOCIAL & WELFARE WKR | 1980 | 2.01442 | 632 | 721 | (766) | 1275 | 1452 | (1543) |
| ARTS & ENTRMNT | 1990 | 1.41673 | 2429 | 2100 | (2190) | 3441 | 2976 | (3103) |
| PROF&TECH WRKS NEC | 1999 | 2.38666 | 3195 | 2054 | (2144) | 7627 | 4902 | (5118) |
| MANAGERS OFF&PROP | 2000 | 1.24099 | 54167 | ? | | 67220 | ? | |
| CONDUCTOR RAILROAD | 2100 | 0.82658 | 267 | 209 | (209) | 221 | 172 | (173) |
| OFFICER PILOT SHIP | 2200 | 1.29826 | 107 | 146 | (146) | 140 | 189 | (190) |
| CREDITMEN | 2300 | 1.75249 | 405 | 354 | (377) | 710 | 620 | (660) |

APPENDIX F
(F-8)

F8A

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 BASED ON BLS METHOD A.

| OCCUPATIONAL DESCRIPTION | TAPE CODE | RATIO OF EMPLOYMENT 75'/60'COL5/3 | ESTIMATED EMPLOYMENT 1960 BASED ON BLS MATRIX & IND.EMP.60' | ESTIMATED EMPLOYMENT 1960 BASED ON DECENNIAL CENSUS | ESTIMATED EMPLOYMENT 1975 BASED ON BLS MATRIX & IND.EMP.75' | ESTIMATED EMPLOYMEN 1975 BASED ON BLS METHOD -A- |
|---|---|---|---|---|---|---|
| PURCHASING AGENT | 2400 | 1.31490 | 1211 | 1053 (1098) | 1593 | 1384 (1444) |
| POSTMASTERS&ASSIST | 2500 | 0.82982 | 234 | 53 (53) | 194 | 43 (44) |
| MGRS OFF&PROP NEC | 2900 | 1.23915 | 51939 | 28480 (29832) | 64361 | 35290 (36962) |
| CLERICAL&KIND WKRS | 3000 | 1.37948 | 77518 | 79029 (82814) | 106934 | 109019 (114200) |
| STENOS TYPISTS SEC | 3100 | 1.49853 | 18672 | 17834 (18690) | 27981 | 26724 (28016) |
| OFFICE MACHINE OPR | 3200 | 1.76629 | 3231 | 3511 (3669) | 5708 | 6201 (6479) |
| OTR CLER&KIND WKRS | 3900 | 1.31704 | 55613 | 0 | 73245 | 0 |
| ACCOUNTING CLERKS | 3910 | 1.13481 | 3116 | 0 | 3536 | 0 |
| BOOKKEEPERS HAND | 3920 | 1.31729 | 4815 | 5724 (5994) | 6342 | 7540 (7894) |
| BANK TELLERS | 3930 | 2.19871 | 864 | 765 (810) | 1900 | 1632 (1781) |
| CASHIERS | 3940 | 2.08902 | 3768 | 3876 (4056) | 7871 | 8097 (8473) |
| MAIL CARRIERS | 3950 | 1.34127 | 1232 | 1465 (1533) | 1653 | 1964 (2056) |
| POSTAL CLERKS | 3970 | 1.33141 | 1455 | 1417 (1485) | 1938 | 1886 (1976) |
| SHIP&RECEIVING CLK | 3980 | 1.02522 | 3106 | 3199 (3357) | 3184 | 3279 (3441) |
| TELEPHONE OPERATOR | 3990 | 0.95066 | 2543 | 2083 (2173) | 2418 | 1980 (2066) |
| CLER&KIND WKRS NEC | 3999 | 1.27911 | 34710 | 27324 (28631) | 44398 | 34950 (36619) |
| SALES WORKERS | 4000 | 1.27020 | 37361 | 37818 (39621) | 47456 | 48036 (50319) |
| INS AGENTS&BROKERS | 4100 | 0.0 | 0 | 2525 (2638) | 0 | 0 |
| REAL ESTATE AGENTS | 4200 | 0.0 | 0 | 1257 (1325) | 0 | 0 |
| OTR SALES WKRS NEC | 4900 | 1.27020 | 37361 | 34036 (35658) | 47456 | 43232 (45286) |
| CRAFT FOREMEN&KIND | 5000 | 1.23481 | 75643 | 73806 (77344) | 93405 | 91135 (95520) |
| CONSTRUCTION CRAFT | 5100 | 1.15385 | 18362 | 14686 (15384) | 21187 | 16945 (17753) |

F.8A

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 BASED ON BLS METHOD A.

| OCCUPATIONAL DESCRIPTION | TAPE CODE | RATIO OF EMPLOYMENT 75'/60'COL5/3 | ESTIMATED EMPLOYMENT 1960 BASED ON BLS MATRIX & IND.EMP.60' | ESTIMATED EMPLOYMENT 1960 BASED ON DECENNIAL CENSUS | ESTIMATED EMPLOYMENT 1975 BASED ON BLS MATRIX & IND.EMP.75' | ESTIMATED EMPLOYMEN 1975 BASED ON BLS METHOD -A- |
|---|---|---|---|---|---|---|
| CARPENTERS | 5110 | 1.01325 | 5770 | 3952 (4132) | 5846 | 4004 (4186) |
| BRICK&STONEMASONS | 5120 | 1.20472 | 1316 | 1611 (1679) | 1585 | 1940 (2023) |
| CEMENTMASONS | 5130 | 1.59865 | 317 | 318 (341) | 506 | 508 (545) |
| ELECTRICIANS | 5140 | 1.14852 | 3007 | 2662 (2797) | 3454 | 3057 (3214) |
| EXCAVAT MACH OPRS | 5145 | 1.38471 | 1528 | 758 (803) | 2116 | 1049 (1112) |
| PAINTERS&PAPERHANG | 5150 | 1.04399 | 2914 | 2286 (2399) | 3043 | 2386 (2505) |
| PLASTERERS | 5160 | 1.18993 | 346 | 337 (360) | 412 | 401 (428) |
| PLUMBERS&PIPEFITRS | 5170 | 1.32828 | 2250 | 1979 (2069) | 2989 | 2628 (2748) |
| ROOFERS & SLATERS | 5180 | 1.31087 | 341 | 346 (369) | 447 | 453 (484) |
| STRUCT METALWORKER | 5190 | 1.37892 | 569 | 437 (460) | 784 | 602 (634) |
| FOREMEN NEC | 5200 | 1.38490 | 10530 | 11419 (11960) | 14583 | 15814 (16565) |
| MIL CRAFT EXC MECH | 5300 | 1.01418 | 17484 | 15459 (16203) | 17732 | 15678 (16430) |
| SKILLED MACHNG WKR | 5310 | 0.91107 | 9199 | 7027 (7365) | 8381 | 6402 (6710) |
| BLACKSMITHS&FORGE | 5320 | 0.84942 | 326 | 440 (463) | 277 | 373 (393) |
| BOILERMAKERS | 5325 | 1.07633 | 201 | 106 (106) | 216 | 114 (114) |
| HEAT TREATERS | 5330 | 1.09377 | 353 | 580 (603) | 386 | 634 (660) |
| MILLWRIGHTS | 5340 | 1.25796 | 709 | 586 (609) | 892 | 737 (766) |
| MOLDERS, METAL | 5350 | 1.12731 | 882 | 1085 (1130) | 994 | 1223 (1274) |
| PATTERNMKRS MTL&WD | 5360 | 1.04370 | 551 | 1044 (1089) | 575 | 1089 (1137) |
| ROLLERS&ROLL HANDS | 5370 | 1.29107 | 392 | 136 (136) | 506 | 175 (176) |
| SHEET METAL WRS | 5380 | 1.18330 | 1479 | 1446 (1514) | 1750 | 1711 (1791) |
| TOOL&DIEMAKERS&SET | 5390 | 1.10636 | 3389 | 3009 (3144) | 3751 | 3330 (3480) |

~~APPENDIX F (F-8)~~

F8A

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 BASED ON BLS METHOD A.

| OCCUPATIONAL DESCRIPTION | TAPE CODE | RATIO OF EMPLOYMENT 75'/60'COL5/3 | ESTIMATED EMPLOYMENT 1960 BASED ON BLS MATRIX & IND.EMP.60' | ESTIMATED EMPLOYMENT 1960 BASED ON DECENNIAL CENSUS | ESTIMATED EMPLOYMENT 1975 BASED ON BLS MATRIX & IND.EMP.75' | ESTIMATED EMPLOYMEN 1975 BASED ON BLS METHOD -A- |
|---|---|---|---|---|---|---|
| MECHANICS&REPAIRMN | 5400 | 1.52986 | 15129 | 16209 (16975) | 23146 | 24797 (25972) |
| AIR COND,HEAT,MECH | 5410 | Included in tape code # 5499 | | | | |
| AIRPLANE MECHANICS | 5420 | 0.84661 | 754 | 169 (169) | 638 | 143 (143) |
| MOTOR VEHICLE MECH | 5430 | 1.49170 | 4341 | 4299 (4502) | 6476 | 6412 (6717) |
| OFFICE MACH MECH | 5440 | 2.02733 | 353 | 277 (300) | 717 | 561 (608) |
| RADIO&TV MECHANICS | 5450 | 1.37044 | 736 | 693 (716) | 1009 | 949 (981) |
| RR & CAR SHOP MECH | 5460 | 0.84962 | 261 | 323 (346) | 222 | 274 (294) |
| OTR MECH&REPAIRMEN | 5499 | 1.62209 | 8681 | 10448 (10944) | 14081 | 16947 (17751) |
| PRINTING CRAFTSMEN | 5600 | 0.93742 | 2868 | 2982 (3117) | 2689 | 2795 (2921) |
| COMPOSITOR&TYPSTRS | 5610 | 0.72078 | 1715 | 1370 (1438) | 1236 | 987 (1037) |
| ELECT&STEREOTYPERS | 5620 | 0.49617 | 90 | 85 (85) | 44 | 42 (42) |
| ENGRAVER EXC PHOTO | 5630 | 1.26386 | 104 | 135 (135) | 131 | 170 (171) |
| PHOTO&LITHOGRAPHER | 5640 | 1.95873 | 236 | 525 (548) | 463 | 1028 (1074) |
| PRES&PLATE PRINTRS | 5650 | 1.12522 | 722 | 867 (912) | 812 | 975 (1026) |
| TRANS&PU CRAFTSMEN | 5700 | 0.99465 | 2641 | 2187 (2300) | 2627 | 2175 (2288) |
| LINEMEN TELE&POWER | 5710 | 1.10820 | 2097 | 1637 (1705) | 2324 | 1814 (1889) |
| LOCOMOTIVE ENGINRS | 5720 | 0.93221 | 289 | 341 (364) | 270 | 317 (339) |
| LOCOMOTIVE FIREMEN | 5730 | 0.12876 | 254 | 209 (209) | 32 | 26 (27) |
| OTR CRAFT&KIND WKS | 5900 | 1.32616 | 8625 | 0 (0) | 11439 | 0 (0) |
| BAKERS | 5910 | 0.77447 | 872 | 1164 (1209) | 676 | 901 (936) |
| CABINETMAKERS | 5915 | 1.05043 | 365 | 592 (615) | 383 | 621 (646) |
| CRANEMEN&HOISTMEN | 5920 | 1.44071 | 1301 | 1787 (1877) | 1874 | 2574 (2705) |

~~APPENDIX F (F-8)~~

F8 A

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 BASED ON BLS METHOD A.

| OCCUPATIONAL DESCRIPTION | TAPE CODE | RATIO OF EMPLOYMENT 75'/60'COL5/3 | ESTIMATED EMPLOYMENT 1960 BASED ON BLS MATRIX & IND.EMP.60' | ESTIMATED EMPLOYMENT 1960 BASED ON DECENNIAL CENSUS | | ESTIMATED EMPLOYMENT 1975 BASED ON BLS MATRIX & IND.EMP.75' | ESTIMATED EMPLOYMEN 1975 BASED ON BLS METHOD -A- | |
|---|---|---|---|---|---|---|---|---|
| GLAZIERS | 5925 | 1.80311 | 90 | 146 | (146) | 163 | 263 | (263) |
| JEWELERS&WATCHMKRS | 5930 | 1.03481 | 239 | 217 | (217) | 247 | 224 | (224) |
| LOOM FIXERS | 5935 | 1.34262 | 36 | 4 | (4) | 48 | 5 | (5) |
| OPTICIANS | 5950 | 1.21438 | 153 | 162 | (162) | 186 | 196 | (197) |
| INSPECTORS LOG&LUM | 5970 | 1.03675 | 53 | 17 | (17) | 55 | 17 | (18) |
| INSPECTORS OTHER | 5980 | 1.47369 | 716 | 587 | (610) | 1056 | 865 | (899) |
| UPHOLSTERERS | 5990 | 1.29906 | 353 | 428 | (451) | 459 | 555 | (586) |
| CRAFT&KIND WKS NEC | 5999 | 1.41522 | 4442 | 519 | (542) | 6287 | 734 | (767) |
| OPERATIVES&KIND | 6000 | 1.15563 | 105746 | 101532 | (106399) | 122204 | 117333 | (122997) |
| DRIVERS&DELVRYMEN | 6200 | 1.30540 | 18666 | 14390 | (15088) | 24367 | 18784 | (19690) |
| DRIVERS BUS&TRUCK | 6210 | 1.33692 | 13058 | 10960 | (11478) | 17458 | 14652 | (15346) |
| DELIVERYMEN | 6220 | 1.23201 | 5607 | 3428 | (3586) | 6908 | 4223 | (4418) |
| SEMISKILL MTL OCCS | 6300 | 1.07395 | 24245 | 0 | (0) | 26038 | 0 | (0) |
| ASSEMBLER MTL CL A | 6310 | | | | | | | |
| ASSEMBLER MTL CL B | 6320 | | | | | | | |
| INSPECTORS METL CLB | 6330 | | | | | | | |
| MACH TOOL OPR CL B | 6340 | | Included in tape code # 6999 | | | | | |
| ELECTROPLATERS | 6350 | | | | | | | |
| ELECTROPLAT HELPER | 6360 | | | | | | | |
| FURNACEMEN SMELTER | 6370 | 1.24194 | 710 | 505 | (528) | 882 | 627 | (656) |
| HEATERS METAL | 6380 | 1.48799 | 90 | 108 | (108) | 134 | 160 | (161) |
| WELDERS&FLAMECUTRS | 6390 | 1.50414 | 4713 | 6325 | (6618) | 7090 | 9513 | (9953) |

F8A

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 BASED ON BLS METHOD A.

| OCCUPATIONAL DESCRIPTION | TAPE CODE | RATIO OF EMPLOYMENT 75'/60'COL5/3 | ESTIMATED EMPLOYMENT 1960 BASED ON BLS MATRIX & IND.EMP.60' | ESTIMATED EMPLOYMENT 1960 BASED ON DECENNIAL CENSUS | ESTIMATED EMPLOYMENT 1975 BASED ON BLS MATRIX & IND.EMP.75' | ESTIMATED EMPLOYMEN 1975 BASED ON BLS METHOD -A- |
|---|---|---|---|---|---|---|
| SELECT TRANS&PU OP | 6700 | 0.98420 | 925 | 1038 (1083) | 911 | 1021 (1066) |
| BRAKEMEN RAILROAD | 6710 | 0.90524 | 662 | 724 (769) | 599 | 655 (696) |
| POWER STATION OPRS | 6720 | 1.20638 | 155 | 106 (106) | 187 | 127 (128) |
| SAILORS&DECK HANDS | 6730 | 1.14946 | 107 | 208 (208) | 123 | 239 (239) |
| SEMISKILL TEXT OCC | 6800 | 0.89132 | 2674 | 2388 (2501) | 2383 | 2128 (2228) |
| KNITTERS&LOOPERS | 6810 | 1.44575 | 59 | 121 (121) | 85 | 174 (175) |
| SPINNERS TEXTILE | 6820 | 0.87935 | 72 | 16 (16) | 64 | 14 (14) |
| WEAVERS TEXTILE | 6830 | 1.02797 | 92 | 41 (41) | 95 | 42 (42) |
| SEWERS&STITCHS MFG | 6840 | 0.87306 | 2449 | 2210 (2323) | 2138 | 1929 (2028) |
| OTR OPER&KIND WKRS | 6900 | 1.15647 | 59235 | 45931 (48139) | 68504 | 53096 (55649) |
| ASBESTOS WORKERS | 6910 | 1.36034 | 142 | 168 (168) | 193 | 228 (228) |
| ATTENDANTS AUTO PK | 6920 | 1.49495 | 2491 | 1925 (2015) | 3725 | 2877 (3012) |
| BLASTERS&POWDERMEN | 6930 | 1.39649 | 13 | 4 (4) | 18 | 5 (6) |
| LAUND&DRY CLEAN WK | 6940 | 1.13129 | 2439 | 2317 (2430) | 2759 | 2621 (2748) |
| MINE OP&LABORS NEC | 6950 | 0.66318 | 209 | 125 (125) | 138 | 82 (83) |
| MEATCUTTERS EXC PK | 6960 | 1.23675 | 1469 | 1231 (1299) | 1817 | 1522 (1607) |
| OTR OPERATIVES NEC | 6999 | 1.14068 | 52469 | 52711 (55235) | 59851 | 60143 (63023) |
| SERVICE WORKERS | 7000 | 1.69067 | 40869 | 0 3 (0) | 69096 | 0 (0) |
| PVT HOUSEHOLD WKRS | 7100 | Not included in projections | | | | |
| PROTECT SERV WKRS | 7200 | 1.38441 | 5296 | 5655 (5925) | 7332 | 7828 (8200) |
| FIREMEN | 7210 | 1.59608 | 899 | 1298 (1366) | 1435 | 2071 (2180) |
| POLICE MARSH&SHERF | 7220 | 1.57832 | 1762 | 2208 (2321) | 2959 | 3706 (3897) |

F8A APPENDIX F (F-8)

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 BASED ON BLS METHOD A.

| OCCUPATIONAL DESCRIPTION | TAPE CODE | RATIO OF EMPLOYMENT 75'/60'COL5/3 | ESTIMATED EMPLOYMENT 1960 BASED ON BLS MATRIX & IND.EMP.60' | ESTIMATED EMPLOYMENT 1960 BASED ON DECENNIAL CENSUS | ESTIMATED EMPLOYMENT 1975 BASED ON BLS MATRIX & IND.EMP.75' | ESTIMATED EMPLOYMEN 1975 BASED ON BLS METHOD -A- |
|---|---|---|---|---|---|---|
| GUARDS & WATCHMEN | 7230 | 1.11521 | 2634 | 1493 (1561) | 2938 | 1665 (1740) |
| WAITERS & COOKS | 7300 | 1.75880 | 11909 | 12525 (16269) | 20947 | 22031 (28617) |
| BARTENDERS | 7310 | 1.68850 | 1269 | 2636 (2771) | 2143 | 4450 (4677) |
| COOKS EXC PVT HOUS | 7320 | 1.76076 | 3488 | 3182 (3340) | 6142 | 5602 (5882) |
| COUNTER&FOUNT WKRS | 7330 | 2.15326 | 989 | 899 (944) | 2131 | 1935 (718) |
| WAITERS&WAITRESSES | 7340 | 1.70880 | 6161 | 5808 (6078) | 10528 | 9924 (10387) |
| OTHER SERVICE WKRS | 7900 | 1.72492 | 23663 | 21347 (22361) | 40816 | 36824 (38573) |
| STEWARDESSES AIR | 7910 | Included in tape code # 7999 | | | | |
| ATTENDANTS HOSP | 7920 | 2.61103 | 3360 | 3396 (3554) | 8774 | 8867 (9279) |
| CHARWOMEN&CLEANERS | 7930 | 1.73923 | 1426 | 3088 (3246) | 2480 | 5370 (5645) |
| JANITORS | 7940 | 1.32814 | 3840 | 3293 (3451) | 5100 | 4373 (4583) |
| NURSES PRACTICAL | 7950 | 2.71774 | 1330 | 1070 (1115) | 3615 | 2907 (3031) |
| OTR SERV WKRS NEC | 7999 | 1.51997 | 13673 | 10500 (10996) | 20782 | 15960 (16714) |
| LABORERS EXC FARM | 8000 | 0.97501 | 24540 | 19444 (20368) | 23927 | 18958 (19859) |

APPENDIX F (F-8)

F-8B

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES" INDUSTRY GROWTH U.S. & MILWAUKEE

| ① INDUSTRY DESCRIPTION | ② INDUSTRY CODE | ③ 1960 EST. EMPLOYMENT MILWAUKEE | ④ 1975 ES. EMPLOYMENT MILWAUKEE | ⑤ RATIO 75'-60'/60' MILWAUKEE | ⑥ 1960 EST. EMPLOYMENT U.S. | ⑦ 1975 EST. EMPLOYMENT U.S. | ⑧ RATIO 75'-60'/60' U.S. | ⑨ PERCENT OF U.S. INDUSTRY EMPLOYMENT IN MILWAUKEE |
|---|---|---|---|---|---|---|---|---|
| NONMETALLIC MINING & QUARRYING | 101400 | 600 | 470 | -0.2167 | 125000 | 150005 | 0.2000 | 0.00480 |
| CONSTRUCTION | 200000 | 28068 | 38500 | 0.3717 | 4067997 | 5675009 | 0.3950 | 0.00690 |
| LUMBER & WOOD PROD | 312400 | 1269 | 740 | -0.4169 | 688003 | 615001 | -0.1061 | 0.00184 |
| FURNITURE & FIXTURES | 312500 | 1532 | 2000 | 0.3055 | 394995 | 534996 | 0.3544 | 0.00388 |
| STONE, CLAY & GLASS | 313200 | 1939 | 2084 | 0.0748 | 614002 | 675012 | 0.0994 | 0.00316 |
| PRIMARY METAL IND | 313300 | 15315 | 20893 | 0.3642 | 1230000 | 1310006 | 0.0650 | 0.01245 |
| FAB.MTL PROD INC.ORD | 313400 | 14161 | 21000 | 0.4829 | 1362000 | 1829847 | 0.3435 | 0.01040 |
| FARM MACH & EQUIP | 313522 | 4956 | 5384 | 0.0864 | 113002 | 160000 | 0.4159 | 0.04386 |
| MISCELLANEOUS MACH | 313592 | 42151 | 51567 | 0.2234 | 1239000 | 1675005 | 0.3519 | 0.03402 |
| ELECTRICAL MACHINERY | 313600 | 35099 | 39148 | 0.1154 | 1464999 | 2035005 | 0.3891 | 0.02396 |
| TRANSPORTATION EQUIP | 313700 | 19200 | 11400 | -0.4063 | 1683999 | 1840067 | 0.0927 | 0.01140 |
| PROF&SCIENT INSTR | 313600 | 3068 | 4855 | 0.5825 | 402996 | 540000 | 0.3400 | 0.00761 |
| MISCELLANEOUS MFG. | 313900 | 2118 | 2928 | 0.3824 | 408997 | 504999 | 0.2347 | 0.00518 |
| MEAT PRODUCTS | 322010 | 4398 | 1457 | -0.6687 | 324000 | 285002 | -0.1204 | 0.01357 |
| DAIRY PRODUCTS | 322020 | 2306 | 1840 | -0.2021 | 318999 | 265002 | -0.1693 | 0.00723 |
| CAN, PRESERV&FREEZING | 322030 | 411 | 1180 | 1.8710 | 246002 | 305004 | 0.2398 | 0.00167 |
| BAKERY PRODUCTS | 322050 | 2921 | 1787 | -0.3882 | 313997 | 260001 | -0.1720 | 0.00930 |
| BEVERAGES | 322080 | 8617 | 6522 | -0.2431 | 218999 | 225003 | 0.0274 | 0.03935 |
| TOBACCO PRODUCTS | 322100 | 2177 | 1972 | -0.0942 | 93003 | 80000 | -0.1398 | 0.02341 |
| TEXTILE MILL PROD | 322200 | 1242 | 1759 | 0.4163 | 918996 | 890002 | -0.0315 | 0.00135 |
| APPAREL & MISC FAB TEXTILE PRODS | 322300 | 3355 | 2378 | -0.2912 | 1240994 | 1550007 | 0.2490 | 0.00270 |
| PULP, PAPER & ALLIED PRODS | 322600 | 4615 | 5100 | 0.1051 | 597006 | 790000 | 0.3233 | 0.00773 |

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"    INDUSTRY GROWTH U.S. & MILWAUKEE

| INDUSTRY DESCRIPTION | INDUSTRY CODE | 1960 EST. EMPLOYMENT MILWAUKEE | 1975 ES. EMPLOYMENT MILWAUKEE | RATIO 75'-60'/60' MILWAUKEE | 1960 EST. EMPLOYMENT U.S. | 1975 EST. EMPLOYMENT U.S. | RATIO 75'-60'/60' U.S. | PERCENT OF U.S. INDUSTRY EMPLOYMENT IN MILWAUKEE |
|---|---|---|---|---|---|---|---|---|
| PRINTING&PUBLISHING | 322700 | 10878 | 11315 | 0.0402 | 1114002 | 1364999 | 0.2253 | 0.00976 |
| CHEM & ALLIED PROD | 322800 | 2753 | 2775 | 0.0080 | 832997 | 1140008 | 0.3686 | 0.00330 |
| PET.REF&COAL PRODS | 322900 | 42 | 5 | -0.8810 | 209996 | 160003 | -0.2381 | 0.00020 |
| RUBBER&MISC PLASTIC PRODUCTS | 323000 | 1045 | 2982 | 1.8536 | 376996 | 590006 | 0.5650 | 0.00277 |
| LEATHER PRODUCTS | 323100 | 6112 | 6111 | -0.0002 | 361001 | 354998 | -0.0165 | 0.01693 |
| RAILROADS | 414000 | 5289 | 3875 | -0.2673 | 869000 | 790007 | -0.0909 | 0.00609 |
| LOCAL & INTERURBAN PASSENGER | 414100 | 4595 | 3939 | -0.1428 | 381003 | 374998 | -0.0158 | 0.01206 |
| TRUCKING&WAREHOUSING | 414200 | 7144 | 12105 | 0.6944 | 981997 | 1260002 | 0.2831 | 0.00727 |
| WATER TRANSPORTATION | 414400 | 613 | 896 | 0.4617 | 222998 | 220001 | -0.0134 | 0.00275 |
| AIR TRANSPORTATION | 414500 | 507 | 683 | 0.3471 | 206002 | 354998 | 0.7233 | 0.00246 |
| TRANSPORTATION SERV | 414700 | 705 | 967 | 0.3716 | 91003 | 155003 | 0.7033 | 0.00775 |
| COMMUNICATIONS | 424600 | 5667 | 3800 | -0.3295 | 832000 | 1009996 | 0.2139 | 0.00681 |
| UTILITIES | 424900 | 6992 | 11050 | 0.5804 | 929998 | 1204997 | 0.2957 | 0.00752 |
| WHOLESALE TRADE | 510000 | 26554 | 34676 | 0.3059 | 3199001 | 4405000 | 0.3770 | 0.00830 |
| BUILDING MATERIALS HARDWARE&FARMEQUIP | 525200 | 2936 | 1965 | -0.3307 | 662001 | 699999 | 0.0574 | 0.00444 |
| GENERAL MERCHANDISING | 525300 | 17071 | 27567 | 0.6148 | 1612994 | 2735004 | 0.6956 | 0.01058 |
| FOOD & DAIRY STORES | 525400 | 13881 | 18743 | 0.3503 | 1790005 | 2255003 | 0.2598 | 0.00775 |
| AUTO DEALERS & GAS STATIONS | 525500 | 10205 | 15014 | 0.4712 | 1548020 | 2075001 | 0.3404 | 0.00659 |
| APPAREL & ACCESS | 525600 | 5651 | 5130 | -0.0922 | 712000 | 795000 | 0.1166 | 0.00794 |
| FURNITURE,FURNISH & APPL. | 525700 | 3373 | 4353 | 0.2905 | 513999 | 604999 | 0.1770 | 0.00656 |
| EATING&DRINKING PLACES | 525800 | 15302 | 29196 | 0.9080 | 2014015 | 2959986 | 0.4697 | 0.00760 |
| MISC RETAIL STORES | 525900 | 9012 | 11417 | 0.2669 | 1313003 | 1925002 | 0.4661 | 0.00686 |

Γ-8B

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"    INDUSTRY GROWTH U.S. & MILWAUKEE

| INDUSTRY DESCRIPTION | INDUSTRY CODE | 1960 EST. EMPLOYMENT MILWAUKEE | 1975 ES. EMPLOYMENT MILWAUKEE | RATIO 75'-60'/60' MILWAUKEE | 1960 EST. EMPLOYMENT U.S. | 1975 EST. EMPLOYMENT U.S. | RATIO 75'-60'/60' U.S. | PERCENT-OF-U.S. INDUSTRY EMPLOYMENT IN MILWAUKEE |
|---|---|---|---|---|---|---|---|---|
| BANKS & CREDIT AGEN | 606010 | 6425 | 11526 | 0.7939 | 944000 | 1595004 | 0.6896 | 0.00681 |
| STOCK BROKERS &INVEST | 606020 | 984 | 1806 | 0.8354 | 145000 | 220000 | 0.5172 | 0.00679 |
| INSURANCE | 606300 | 9692 | 12711 | 0.3115 | 1082999 | 1320000 | 0.2188 | 0.00895 |
| REAL ESTATE | 606500 | 5883 | 4753 | -0.1921 | 680002 | 845000 | 0.2426 | 0.00865 |
| HOTELS&OTHER LODGING PLACES | 707000 | 2946 | 4000 | 0.3578 | 681004 | 1019996 | 0.4978 | 0.00433 |
| OTR PERSONAL SERV | 707200 | 8689 | 11050 | 0.2717 | 1407003 | 1859996 | 0.3220 | 0.00618 |
| MISC BUSINESS SERV | 707300 | 6699 | 14360 | 1.1436 | 869005 | 2039998 | 1.3475 | 0.00771 |
| AUTO REPAIR SERVICES | 707500 | 1807 | 3245 | 0.7958 | 404002 | 580003 | 0.4356 | 0.00447 |
| OTR REPAIR SERVICES | 707600 | 1752 | 2364 | 0.3493 | 282001 | 375000 | 0.3298 | 0.00621 |
| MOTION PICT &THEAT | 707800 | 2215 | 2178 | -0.0167 | 197003 | 229999 | 0.1675 | 0.01124 |
| MISC ENTER&RECREAT | 707900 | 2492 | 3084 | 0.2376 | 307002 | 605001 | 0.9707 | 0.00812 |
| MEDICAL&OTR HEALTH SERVICES | 708000 | 21360 | 44324 | 1.0751 | 2777007 | 5349997 | 0.9265 | 0.00769 |
| LEGAL SERVICES | 708100 | 2136 | 4313 | 1.0192 | 292000 | 455000 | 0.5582 | 0.00732 |
| EDUCATIONAL SERV | 708200 | 21183<br>5775 | 62,000<br>11673 | 1.0213 | 3580000 | 6834998 | 0.9092 | 0.00161 |
| NONPROFIT WELFARE & RELIGIOUS ORG | 708600 | 6107 | 8385 | 0.3730 | 943998 | 1359991 | 0.4407 | 0.00647 |
| OTR PROF&REL SERV | 708900 | 3283 | 7285 | 1.2190 | 500001 | 995002 | 0.9900 | 0.00657 |
| GOVERN PUB ADM | 900000 | 19300 | 29300 | 0.5181 | 3218002 | 5140011 | 0.5973 | 0.00600 |

F8C APPENDIX F (F-8)

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES" SOURCES OF PROJECTED OCCUPATIONAL GROWTH

| ① OCCUPATION | ② CODE | ③ 1960 ESTIMATED EMP. | ④ 1975 ESTIMATED EMP. | ⑤ 1975-1960 | ⑥ DUE TO IND. GROWTH | ⑦ DUE TO OCC. MIX CHANGE |
|---|---|---|---|---|---|---|
| ENGINEERS TECH | 1100 | 9478 | 14553 | 5075 | 2950 | 2125 |
| ENGR AERONAUTICAL | 1110 | 491 | 445 | -45 | 76 | -121 |
| ENGINEER CHEMICAL | 1120 | 226 | 303 | 76 | 25 | 51 |
| ENGINEER CIVIL | 1130 | 1024 | 1688 | 663 | 188 | 475 |
| ENGINEERS ELECTRIC | 1140 | 2515 | 3707 | 1191 | 720 | 471 |
| ENGINEER INDUST | 1150 | 1105 | 1907 | 802 | 587 | 215 |
| ENGR MECHANICAL | 1160 | 2229 | 3163 | 933 | 490 | 443 |
| ENGR METALLURGICAL | 1170 | 262 | 439 | 177 | 102 | 75 |
| ENGINEER MINING | 1180 | 20 | 19 | 0 | -9 | 9 |
| ENGINEERS,SALES | 1190 | 0 | 0 | 0 | 0 | 0 |
| OTR ENGR, TECH | 1199 | 1603 | 2879 | 1276 | 765 | 510 |
| MED&OTR HEALTH WKR | 1200 | 9686 | 17517 | 7830 | -1677 | 9507 |
| DENTISTS | 1210 | 663 | 1024 | 360 | -349 | 709 |
| DIETICIANS&NUTRITI | 1220 | 179 | 264 | 84 | -91 | 175 |
| NURSES PROFESSIONAL | 1230 | 3737 | 6942 | 3204 | -662 | 3866 |
| OPTOMETRISTS | 1240 | 128 | 165 | 37 | -82 | 119 |
| OSTEOPATHS | 1250 | 100 | 135 | 35 | -71 | 106 |
| PHARMACISTS | 1260 | 779 | 768 | -10 | -257 | 247 |
| PHYSICIANS&SURGEON | 1265 | 1671 | 3037 | 1365 | -396 | 1761 |
| PSYCHOLOGISTS | 1270 | 73 | 161 | 88 | 21 | 67 |
| TECH MED & DENTAL | 1280 | 1057 | 3215 | 2157 | 1056 | 1101 |
| VETERINARIANS | 1290 | 19 | 31 | 11 | 0 | 11 |

F8C **APPENDIX F (F-8)**

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"

SOURCES OF PROJECTED OCCUPATIONAL GROWTH

| OCCUPATION | CODE | 1960 ESTIMATED EMP. | 1975 ESTIMATED EMP. | 1975-1960 | DUE TO IND. GROWTH | DUE TO OCC. MIX CHANGE |
|---|---|---|---|---|---|---|
| OTR MED & HEALTH | 1299 | 1275 | 1770 | 494 | -843 | 1337 |
| TEACHERS | 1300 | 3346 | 5690 | 2344 | -927 | 3271 |
| TEACH ELEMENTARY | 1310 | 1596 | 2134 | 537 | -1078 | 1615 |
| TEACHERS SECONDARY | 1320 | 980 | 1904 | 924 | -72 | 996 |
| TEACHERS COLLEGE | 1330 | 332 | 777 | 444 | 104 | 340 |
| TEACH OTR EXC COLL | 1399 | 436 | 874 | 437 | 119 | 318 |
| NATURAL SCIENTISTS | 1400 | 1359 | 2350 | 990 | 464 | 526 |
| CHEMISTS | 1410 | 534 | 887 | 353 | 191 | 162 |
| AGRICULTURAL SCIEN | 1420 | 115 | 169 | 54 | -3 | 57 |
| BIOLOGICAL SCIENT | 1430 | 142 | 293 | 151 | 53 | 98 |
| GEOLOG & GEOPHYSIC | 1440 | 40 | 92 | 51 | 28 | 23 |
| MATHEMATICIANS | 1450 | 187 | 364 | 177 | 124 | 53 |
| PHYSICISTS | 1460 | 213 | 373 | 160 | 89 | 71 |
| OTR NATURAL SCIENT | 1499 | 125 | 167 | 42 | -19 | 61 |
| SOCIAL SCIENTISTS | 1500 | 361 | 554 | 193 | 53 | 140 |
| ECONOMISTS | 1510 | 148 | 232 | 83 | 22 | 61 |
| STATISTICIANS&ACT | 1520 | 181 | 263 | 82 | 20 | 62 |
| OTR SOCIAL SCIENT | 1599 | 31 | 59 | 27 | 10 | 17 |
| TECH EXC MED&DENT | 1600 | 7383 | 12583 | 5200 | 3073 | 2127 |
| DRAFTSMEN | 1610 | 2921 | 4145 | 1224 | 344 | 880 |
| SURVEYORS | 1620 | 274 | 534 | 260 | 67 | 193 |
| AIR TRAFFIC CONTRO | 1630 | 71 | 75 | 3 | -33 | 36 |

F8C APPENDIX F (F-8)

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"

SOURCES OF PROJECTED OCCUPATIONAL GROWTH

| OCCUPATION | CODE | 1960 ESTIMATED EMP. | 1975 ESTIMATED EMP. | 1975-1960 | DUE TO IND. GROWTH | DUE TO OCC. MIX CHANGE |
|---|---|---|---|---|---|---|
| RADIO OPERATORS | 1640 | 106 | 155 | 49 | 23 | 26 |
| TECH ELEC&ELECTRONIC | 1650 | 0 | 0 | 0 | 0 | 0 |
| TECH,OTR ENG&PHY SCI | 1660 | 0 | 0 | 0 | 0 | 0 |
| TECHNICIANS OTHER | 1699 | 4009 | 7672 | 3662 | 2670 | 992 |
| OTR PROF TECH KIND | 1900 | 15924 | 26384 | 10459 | 3420 | 7039 |
| ACCOUNTANTS&AUDIT | 1910 | 3465 | 5142 | 1677 | 105 | 1572 |
| AIRPLANE PILOTS | 1915 | 111 | 175 | 64 | 34 | 30 |
| ARCHITECTS | 1920 | 199 | 319 | 120 | -87 | 207 |
| CLERGYMEN | 1930 | 1288 | 1467 | 179 | -315 | 494 |
| DESIGNERS | 1935 | 624 | 905 | 280 | 66 | 214 |
| EDITORS&REPORTERS | 1940 | 920 | 1015 | 94 | -44 | 138 |
| LAWYERS & JUDGES | 1945 | 1616 | 2794 | 1177 | -209 | 1386 |
| LIBRARIANS | 1950 | 182 | 353 | 170 | 11 | 159 |
| PERSONNEL WORKERS | 1960 | 855 | 1433 | 577 | 285 | 292 |
| PHOTOGRAPHERS | 1970 | 402 | 434 | 31 | -71 | 102 |
| SOCIAL&WELFARE WKR | 1980 | 632 | 1275 | 642 | 287 | 355 |
| ARTS & ENTRMNT | 1990 | 2429 | 3441 | 1012 | -38 | 1050 |
| PROF&TECH WRKS NEC | 1999 | 3195 | 7627 | 4431 | 3395 | 1036 |
| MANAGERS OFF&PROP | 2000 | 54167 | 67220 | 13053 | -6071 | 19124 |
| CONDUCTOR RAILROAD | 2100 | 267 | 221 | -45 | 19 | -65 |
| OFFICER PILOT SHIP | 2200 | 107 | 140 | 32 | -7 | 39 |
| CREDITMEN | 2300 | 405 | 710 | 305 | 150 | 155 |

F&C APPENDIX F (F-8)

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"

SOURCES OF PROJECTED OCCUPATIONAL GROWTH

| OCCUPATION | CODE | 1960 ESTIMATED EMP. | 1975 ESTIMATED EMP. | 1975-1960 | DUE TO IND. GROWTH | DUE TO OCC. MIX CHANGE |
|---|---|---|---|---|---|---|
| PURCHASING AGENT | 2400 | 1211 | 1593 | 381 | 156 | 225 |
| POSTMASTERS&ASSIST | 2500 | 234 | 194 | -39 | -161 | 122 |
| MGRS OFF&PROP NEC | 2900 | 51939 | 64361 | 12421 | -6223 | 18649 |
| CLERICAL&KIND WKRS | 3000 | 77518 | 106934 | 29416 | 2288 | 27128 |
| STENOS TYPISTS SEC | 3100 | 18672 | 27981 | 9308 | 1651 | 7657 |
| OFFICE MACHINE OPR | 3200 | 3231 | 5708 | 2476 | 1499 | 977 |
| OTR CLER&KIND WKRS | 3900 | 55613 | 73245 | 17631 | -862 | 18493 |
| ACCOUNTING CLERKS | 3910 | 3116 | 3536 | 420 | -535 | 955 |
| BOOKKEEPERS HAND | 3920 | 4815 | 6342 | 1527 | -449 | 1976 |
| BANK TELLERS | 3930 | 864 | 1900 | 1036 | 349 | 687 |
| CASHIERS | 3940 | 3768 | 7871 | 4103 | 2616 | 1487 |
| MAIL CARRIERS | 3950 | 1232 | 1653 | 420 | -217 | 637 |
| POSTAL CLERKS | 3970 | 1455 | 1938 | 482 | -271 | 753 |
| SHIP&RECEIVING CLK | 3980 | 3106 | 3184 | 78 | -537 | 615 |
| TELEPHONE OPERATOR | 3990 | 2543 | 2418 | -125 | -118 | -7 |
| CLER&KIND WKRS NEC | 3999 | 34710 | 44398 | 9688 | -1698 | 11386 |
| SALES WORKERS | 4000 | 37361 | 47456 | 10095 | -645 | 10740 |
| INS AGENTS&BROKERS | 4100 | 0 | 0 | 0 | 0 | 0 |
| REAL ESTATE AGENTS | 4200 | 0 | 0 | 0 | 0 | 0 |
| OTR SALES WKRS NEC | 4900 | 37361 | 47456 | 10095 | -645 | 10740 |
| CRAFT FOREMEN&KIND | 5000 | 75643 | 93405 | 17762 | 1010 | 16752 |
| CONSTRUCTION CRAFT | 5100 | 18362 | 21187 | 2825 | -2838 | 5663 |

F&C APPENDIX F (F-8)

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"

SOURCES OF PROJECTED OCCUPATIONAL GROWTH

| OCCUPATION | CODE | 1960 ESTIMATED EMP. | 1975 ESTIMATED EMP. | 1975-1960 | DUE TO IND. GROWTH | DUE TO OCC. MIX CHANGE |
|---|---|---|---|---|---|---|
| CARPENTERS | 5110 | 5770 | 5846 | 76 | -1737 | 1813 |
| BRICK&STONEMASONS | 5120 | 1316 | 1585 | 269 | -195 | 464 |
| CEMENTMASONS | 5130 | 317 | 506 | 189 | 73 | 116 |
| ELECTRICIANS | 5140 | 3007 | 3454 | 446 | -225 | 671 |
| EXCAVAT MACH OPRS | 5145 | 1528 | 2116 | 588 | 55 | 533 |
| PAINTERS&PAPERHANG | 5150 | 2914 | 3043 | 128 | -983 | 1111 |
| PLASTERERS | 5160 | 346 | 412 | 65 | -61 | 126 |
| PLUMBERS&PIPEFITRS | 5170 | 2250 | 2989 | 738 | 101 | 637 |
| ROOFERS&SLATERS | 5180 | 341 | 447 | 106 | -15 | 121 |
| STRUCT METALWORKER | 5190 | 569 | 784 | 215 | 149 | 66 |
| FOREMEN NEC | 5200 | 10530 | 14583 | 4053 | 2202 | 1851 |
| MIL CRAFT EXC MECH | 5300 | 17484 | 17732 | 248 | -2821 | 3069 |
| SKILLED MACHNG WKR | 5310 | 9199 | 8381 | -818 | -2338 | 1520 |
| BLACKSMITHS&FORGE | 5320 | 326 | 277 | -49 | -121 | 72 |
| BOILERMAKERS | 5325 | 201 | 216 | 15 | -23 | 38 |
| HEAT TREATERS | 5330 | 353 | 386 | 33 | -40 | 73 |
| MILLWRIGHTS | 5340 | 709 | 892 | 182 | 56 | 126 |
| MOLDERS, METAL | 5350 | 882 | 994 | 112 | -125 | 237 |
| PATTERNMKRS MIL&WD | 5360 | 551 | 575 | 24 | -51 | 75 |
| ROLLERS&ROLL HANDS | 5370 | 392 | 506 | 114 | -25 | 139 |
| SHEET METAL WRS | 5380 | 1479 | 1750 | 271 | 3 | 268 |
| TOOL&DIEMAKERS&SET | 5390 | 3389 | 3751 | 362 | -154 | 516 |

F8C **APPENDIX F (F-8)**

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"

SOURCES OF PROJECTED OCCUPATIONAL GROWTH

[illegible]

| OCCUPATION | CODE | 1960 ESTIMATED EMP. | 1975 ESTIMATED EMP. | 1975-1960 | DUE TO IND. GROWTH | DUE TO OCC. MIX CHANGE |
|---|---|---|---|---|---|---|
| MECHANICS&REPAIRMN | 5400 | 15129 | 23146 | 8016 | 3572 | 4444 |
| AIR COND,HEAT,MECH | 5410 | 0 | 0 | 0 | 0 | 0 |
| AIRPLANE MECHANICS | 5420 | 754 | 638 | -115 | -97 | -18 |
| MOTOR VEHICLE MECH | 5430 | 4341 | 6476 | 2134 | 263 | 1871 |
| OFFICE MACH MECH | 5440 | 353 | 717 | 363 | 235 | 127 |
| RADIO&TV MECHANICS | 5450 | 736 | 1009 | 272 | 51 | 221 |
| RR & CAR SHOP MECH | 5460 | 261 | 222 | -39 | 19 | -58 |
| OTR MECH&REPAIRMEN | 5499 | 8681 | 14081 | 5400 | 3097 | 2303 |
| PRINTING CRAFTSMEN | 5600 | 2868 | 2689 | -179 | -399 | 220 |
| COMPOSITOR&TYPSTRS | 5610 | 1715 | 1236 | -479 | -608 | 129 |
| ELECT&STEREOTYPERS | 5620 | 90 | 44 | -45 | -49 | 4 |
| ENGRAVER EXC PHOTO | 5630 | 104 | 131 | 27 | 6 | 21 |
| PHOTO&LITHOGRAPHER | 5640 | 236 | 463 | 227 | 207 | 20 |
| PRES&PLATE PRINTRS | 5650 | 722 | 812 | 90 | 44 | 46 |
| TRANS&PU CRAFTSMEN | 5700 | 2641 | 2627 | -14 | 169 | -183 |
| LINEMEN TELE&POWER | 5710 | 2097 | 2324 | 226 | 285 | -59 |
| LOCOMOTIVE ENGINRS | 5720 | 289 | 270 | -19 | 39 | -58 |
| LOCOMOTIVE FIREMEN | 5730 | 254 | 32 | -221 | -155 | -66 |
| OTR CRAFT&KIND WKS | 5900 | 8625 | 11439 | 2813 | 1125 | 1688 |
| BAKERS | 5910 | 872 | 676 | -196 | -74 | -122 |
| CABINETMAKERS | 5915 | 365 | 383 | 18 | -70 | 88 |
| CRANEMEN&HOISTMEN | 5920 | 1301 | 1874 | 573 | 218 | 355 |

[illegible]

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APPENDIX F-8

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"

SOURCES OF PROJECTED OCCUPATIONAL GROWTH

| OCCUPATION | CODE | 1960 ESTIMATED EMP. | 1975 ESTIMATED EMP. | 1975-1960 | DUE TO IND. GROWTH | DUE TO OCC.-MIX CHANGE |
|---|---|---|---|---|---|---|
| GLAZIERS | 5925 | 90 | 163 | 72 | 61 | 11 |
| JEWELERS&WATCHMKRS | 5930 | 239 | 247 | 8 | -70 | 78 |
| LOOM FIXERS | 5935 | 36 | 48 | 12 | -1 | 13 |
| OPTICIANS | 5950 | 153 | 186 | 32 | -40 | 72 |
| INSPECTORS LOG&LUM | 5970 | 53 | 55 | 1 | 10 | -9 |
| INSPECTORS OTHER | 5980 | 716 | 1056 | 339 | 171 | 168 |
| UPHOLSTERERS | 5990 | 353 | 459 | 105 | 5 | 99 |
| CRAFT&KIND WKS NEC | 5999 | 4442 | 6287 | 1844 | 913 | 931 |
| OPERATIVES&KIND | 6000 | 105746 | 122204 | 16457 | 264 | 16193 |
| DRIVERS&DELVRYMEN | 6200 | 18666 | 24367 | 5700 | 1705 | 3995 |
| DRIVERS BUS&TRUCK | 6210 | 13058 | 17458 | 4399 | 455 | 3943 |
| DELIVERYMEN | 6220 | 5607 | 6908 | 1300 | 1249 | 51 |
| SEMISKILL MTL OCCS | 6300 | 24245 | 26038 | 1792 | -1076 | 2868 |
| ASSEMBLER MTL CL A | 6310 | 2138 | 2596 | 457 | 113 | 344 |
| ASSEMBLER MTL CL B | 6320 | 8093 | 7664 | -429 | -872 | 443 |
| INSPECTORS METL CLB | 6330 | 2993 | 2968 | -25 | -324 | 299 |
| MACH TOOL OPR CL B | 6340 | 5105 | 4242 | -862 | -1509 | 647 |
| ELECTROPLATERS | 6350 | 145 | 180 | 34 | -5 | 39 |
| ELECTROPLAT HELPER | 6360 | 253 | 278 | 25 | -42 | 67 |
| FURNACEMEN SMELTER | 6370 | 710 | 882 | 171 | -47 | 218 |
| HEATERS METAL | 6380 | 90 | 134 | 44 | 17 | 27 |
| WELDERS&FLAMECUTRS | 6390 | 4713 | 7090 | 2376 | 1592 | 784 |

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ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"

SOURCES OF PROJECTED OCCUPATIONAL GROWTH

| OCCUPATION | CODE | 1960 ESTIMATED EMP. | 1975 ESTIMATED EMP. | 1975-1960 | DUE TO IND. GROWTH | DUE TO OCC. MIX CHANGE |
|---|---|---|---|---|---|---|
| SELECT TRANS&PU OP | 6700 | 925 | 911 | -14 | 10 | -24 |
| BRAKEMEN RAILROAD | 6710 | 662 | 599 | -62 | 73 | -135 |
| POWER STATION OPRS | 6720 | 155 | 187 | 32 | -37 | 69 |
| SAILORS&DECK HANDS | 6730 | 107 | 123 | 16 | -25 | 41 |
| SEMISKILL TEXT OCC | 6800 | 2674 | 2383 | -290 | -85 | -205 |
| KNITTERS&LOOPERS | 6810 | 59 | 85 | 26 | 1 | 25 |
| SPINNERS TEXTILE | 6820 | 72 | 64 | -8 | -36 | 28 |
| WEAVERS TEXTILE | 6830 | 92 | 95 | 2 | -33 | 35 |
| SEWERS&STITCHS MFG | 6840 | 2449 | 2138 | -310 | -17 | -293 |
| OTR OPER&KIND WKRS | 6900 | 59235 | 68504 | 9268 | -289 | 9557 |
| ASBESTOS WORKERS | 6910 | 142 | 193 | 51 | 22 | 29 |
| ATTENDANTS AUTO PK | 6920 | 2491 | 3725 | 1233 | 45 | 1188 |
| BLASTERS&POWDERMEN | 6930 | 13 | 18 | 5 | 2 | 3 |
| LAUND&DRY CLEAN WK | 6940 | 2439 | 2759 | 320 | -555 | 875 |
| MINE OP&LABORS NEC | 6950 | 209 | 138 | -70 | -25 | -45 |
| MEATCUTTERS EXC PK | 6960 | 1469 | 1817 | 347 | -188 | 535 |
| OTR OPERATIVES NEC | 6999 | 52469 | 59851 | 7381 | 409 | 6972 |
| SERVICE WORKERS | 7000 | 40869 | 69096 | 28227 | 2622 | 25605 |
| PVT HOUSEHOLD WKRS | 7100 | 0 | 0 | 0 | 0 | 0 |
| PROTECT SERV WKRS | 7200 | 5296 | 7332 | 2035 | -266 | 2301 |
| FIREMEN | 7210 | 899 | 1435 | 535 | 83 | 452 |
| POLICE MARSH&SHERF | 7220 | 1762 | 2959 | 1196 | 289 | 907 |

F8C **APPENDIX F (F-8)**

ESTIMATES OF OCCUPATIONAL EMPLOYMENT NEEDS IN
THE MILWAUKEE SMSA 1975 "SENSITIVITY ANALYSES"

SOURCES OF PROJECTED OCCUPATIONAL GROWTH

| OCCUPATION | CODE | 1960 ESTIMATED EMP. | 1975 ESTIMATED EMP. | 1975-1960 | DUE TO IND. GROWTH | DUE TO OCC. MIX CHANGE |
|---|---|---|---|---|---|---|
| GUARDS & WATCHMEN | 7230 | 2634 | 2938 | 303 | -639 | 942 |
| WAITERS & COOKS | 730C | 11909 | 20947 | 9037 | -553 | 9590 |
| BARTENDERS | 731C | 1269 | 2143 | 874 | -173 | 1047 |
| COOKS EXC PVT HOUS | 732C | 3488 | 6142 | 2654 | -220 | 2874 |
| COUNTER&FOUNT WKRS | 7330 | 989 | 2131 | 1141 | 460 | 681 |
| WAITERS&WAITRESSES | 734C | 6161 | 10528 | 4367 | -619 | 4986 |
| OTHER SERVICE WKRS | 790C | 23663 | 40816 | 17153 | 3442 | 13711 |
| STEWARDESSES AIR | 7910 | 31 | 61 | 29 | 18 | 11 |
| ATTENDANTS HOSP | 792C | 3360 | 8774 | 5414 | 1881 | 3533 |
| CHARWOMEN&CLEANERS | 7930 | 1426 | 2480 | 1054 | 308 | 746 |
| JANITORS | 794C | 3840 | 5100 | 1260 | -130 | 1390 |
| NURSES PRACTICAL | 7950 | 1330 | 3616 | 2285 | 916 | 1369 |
| OTR SERV WKRS NEC | 7999 | 13673 | 20782 | 7109 | 447 | 6652 |
| LABORERS EXC FARM | 8000 | 24540 | 23927 | -613 | -6824 | 6211 |

# APPENDIX G

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Letter to School Administrators (January 11, 1968) G-2

School Training Survey Questionnaire G-3

# APPENDIX G

State of Wisconsin \ DEPARTMENT OF INDUSTRY, LABOR and HUMAN RELATIONS

PUBLIC EMPLOYMENT SERVICE
LOCAL · STATE · NATIONAL

WISCONSIN STATE EMPLOYMENT SERVICE
MAILING ADDRESS: P.O. BOX 1607 ZIP 53701
OFFICES: 4802 SHEBOYGAN AVENUE
MADISON, WISCONSIN
TELEPHONE 266-3106 AREA CODE 608

January 11, 1968

Dear Sir;

The Wisconsin State Employment Service in cooperation with the Metropolitan Milwaukee Association of Commerce is engaged in a community wide project to study the demand for trained manpower by occupation as well as the numbers being trained for that demand.

This study should be of interest to you in planning the type and size of training courses for the coming years, and also in student recruitment programs.

Please examine the attached list of occupations to select the ones appropriate to your institution. Only one occupation is to be listed on a single form. Then indicate as definitely as you can the number of trainees on the specified occupations you can reasonably expect to graduate during the years designated. Also, please note the maximum capacity you could attain should prospective trainees be seeking your type of educational offering in large numbers. Upon completion please return them to us in the enclosed self-addressed envelope by January 24, 1968. If you have any questions we suggest you telephone Mr. Norman Huth at 273-1162 (Extension 27).

Thank you for your interest and cooperation.

Sincerely yours,

James J. Hoppenjan

James J. Hoppenjan, Coordinator
Project VISION

APPENDIX G

## WISCONSIN STATE EMPLOYMENT SERVICE
## METROPOLITAN MILWAUKEE ASSOCIATION OF COMMERCE
## TRAINING SURVEY

Please fill in the requested information as designed below (see accompaning letter) and return this form in the self-addressed envelope provided.

Occupation being surveyed________________________

Institution____________________________________

Address___________________________________Telephone Number______________

Submitted by (name of individual)_______________________________________

Please Indicate:

A. Number of trainees your institution expects to graduate in the occupation above for each of the following years.

B. Your maximum training potential,or class capacity in this occupation for each of the following years.

| A. EXPECTED GRADUATES | B. ANTICIPATED TRAINING CAPACITY: |
|---|---|
| 1967______________ | 1967______________ |
| 1970______________ | 1970______________ |
| 1972______________ | 1972______________ |

# APPENDIX H

# COMPILATION OF SCHOOL SURVEY SUPPLY DATA AND SKILL SURVEY DEMAND DATA ON SELECTED OCCUPATIONS

| | Page |
|---|---|
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| Tables - Selected Occupations | H- 6 |
| Engineering and Technical | H- 6 |
| Trade and Industry | H- 8 |
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Appendix H

# Compilation of School Survey Supply Data and Skill Survey Demand Data on Selected Occupations.

## INTRODUCTION

The following pages contain data relating to 90 occupations of the nearly 200 contained on pre-listed occupational stubs used in the Milwaukee area skill survey. These 90 were selected because the data was found to be the most accurate and valid in terms of current and anticipated employment. The other occupations were omitted primarily because of response problems -- lack of response by too many employers, or response error, e.g., disproportionate number of employers reporting or failing to report particular occupations in particular industries. (Problems relating to data collection and evaluation are discussed in several sections of Chapter IV.) In most instances, labor unions and census data were used as sources for validating the employment information. In general, the occupations having reliable data had the following characteristics: the majority were inter-industry occupations (with the exception of those under Printing and Publishing), and were found in both large and small establishments. While taken from the pre-listed stubs, they were likely also to be found on the open-ended stubs in which employers themselves listed occupations.

We have presented both supply and demand data on these occupations. The supply data (see Chapter X and Appendix G) was obtained from MDTA and apprenticeship data, hospitals, and from area schools (high schools, private business or technical schools, and public vocational schools). The demand data was obtained from findings of the PROJECT VISION skill survey. In presenting supply data in combination with some of the findings from the area skill survey, it was not possible to "match" supply and demand because the sets of figures were not comparable and the terminology problems seemed insurmountable. However, the two types of data are presented alongside each other in a form that permits some comparison and that illustrates the formidable problems involved in matching supply and demand data.

In presenting this material, we have made an effort to break the communication (terminology) barrier between occupational titles and vocational course listings by including related D.O.T. occupational codes and titles and HEW curriculum codes and titles. Data has been grouped by occupational areas, such as Data Processing, Health Occupations, Engineering & Technical Occupations, etc. For each occupational area, the following data is presented:

(1) D.O.T. CODES AND TITLES

(2) HEW CURRICULUM CODES AND TITLES

(3) DEMAND DATA (Occupational titles, current and projected employment, estimated expansion and replacement needs per year--from skill survey results)

(4) SUPPLY DATA (occupational or course listings and estimated graduates--from area high schools, vocational schools, business schools, MDTA and Apprenticeship data.)

(5) EXPLANATORY FOOTNOTES (giving sources of supply data; terminology problems; problems in compiling and interpreting supply data, etc.)

D.O.T. codes and titles have been matched to corresponding HEW codes and titles, and are listed side by side at the top of each occupational section. As nearly as possible, the D.O.T. codes and titles correspond to the occupational titles listed under DEMAND; and the HEW codes and titles correspond to the listings under SUPPLY. Thus, in rather a roundabout way, we attempted to "match" the dissimilar supply and demand listings. The matching is necessarily imperfect since occupational titles mean different things to different employers, and they often cover varying job requirements; and like-sounding school courses differ considerably in length and content. Relationships are clearly there, however, which have significance for vocational educators and for employers seeking trained workers. In using D.O.T. and HEW terminology, we have attempted to establish some uniformity of language in order to point up these relationships.

As indicated above, the demand and supply figures are not comparable: demand figures represent expansion of survey sample results; supply figures represent exact numbers given by the limited number of respondents to the supply survey. The supply figures are admittedly inadequate since we did not attempt any follow-up of respondents and had only limited contacts with a few non-respondents.

It should be noted that certain occupations have been combined in the demand presentation (e.g., "Other Draftsmen"), so that the 90 occupations have been reduced to approximately 80 titles on the following pages. Supply figures from more than one source have been combined when there was some reasonable basis for assuming the courses were similar in content and length. Often, however, the figures from similar-sounding courses have been listed separately.

Finally, it should be pointed out that supply sources were asked to state estimated capacity, as well as estimated graduates, for 1967, 1970 and 1972. We have not presented capacity data here. Since this would seem to be important data, some explanation for this omission is required. Primarily, the variations in response rendered this data almost impossible to compile and interpret. (These problems pertained to the graduate data, also, but in somewhat lesser degree) For example:

(1) Some sources provided no capacity estimates at all.

(2) Some did not provide for the 3 time periods and/or accompanied some of of their estimates with multiple question marks.

(3) Some stated estimates in terms of class capacity, without indicating number of classes possible. (One stated "25 at once" for 1970 and 1972.)

(4) Some simply stated that capacity depends "on demand." (It appeared

that some of the private training institutions also stated their graduate figures in these terms!)

(5) Some estimates were apparently fairly well reasoned out, while others appeared to be no more than broad guesses, creating considerable speculation as to what criteria, if any, were used in making the estimates.

(6) Here, as with the graduate estimates, there was the problem of course length and course content in trying to determine overall capacity for specific occupations or specific courses among several schools.

We can sum up the "capacity" data with these observations:

(1) With few exceptions, capacity was much larger than anticipated graduates in all three time periods. It was apparent that capacity could meet a greatly expanded demand, especially in private business and training institutes and in high school clerical courses.

(2) Capacity was considerably larger than anticipated graduates for: computer programming; stenographers; various engineering technicians; 2-year accounting; and welders. (In welding, however, the large capacity was nearly matched by the rather large number of graduates anticipated in 1970 and 1972 by a private welding school and in 1972 by a large area vocational school.)

(3) Capacity was the same as or only slightly larger than anticipated graduates for: nurse aid/orderly; auto body; stationary engineer; machinists; tool and die maker; milling and boring machine operators ; shapers and planers; and most Printing and Publishing occupations. (In some cases, such as machinists and some printing occupations, capacity was sometimes double the anticipated graduates, but the figures were very small, like 20 capacity compared to 12 graduates, or 6 to 3.)

Again, the data is extremely limited. We have not here made any effort to raise questions of wage levels, of in- and out-migration, of what "share" of the labor supply should be provided by school trainees, of what happens to school graduates (do they enter the jobs for which they trained?), etc.

APPENDIX H

## SELECTED ENGINEERING & TECHNICAL OCCUPATIONS

| DOT CODE AND TITLE | NEW CODE AND TITLE |
|---|---|
| 003.081 Electrical Engineer | 16.01.07 Electrical Engineering Technology |
| 003.181 Electrical Technician | |
| 003.181 Electronic Technician | 16.01.08 Electronics Engineering Technology |
| 005.081 Civil Engineer | 16.01.06 Civil Engineering Technology |
| 007.081 Mechanical Engineer | 16.01.13 Mechanical Engineering Technology |
| 007.181 Engineering Assistant | |
| 007.181 Mech. Engineering Tech. | |
| 008.081 Chemical Engineer | 16.01.05 Chemical Engineering Technology |
| 012.188 Industrial Engineer | 16.01.11 Industrial Engineering Technology |
| 003.281 Electrical Draftsman | 17.13 Drafting Occupations |
| 007.281 Mechanical Draftsman | |
| 017.281 Detailer | |

DEMAND

| | Estimated Employment | | | Est. Replacement and Expansion Needs - Per Yr. | |
|---|---|---|---|---|---|
| | 1967 | 1970 | 1972 | 1967-70 | 1970-72 |
| Electrical Engineer | 2400 | 2860 | 3020 | 270 | 200 |
| Electrical Technician[1]<br>Electronic Technician<br>Electrical Draftsman | 1980 | 2240 | 2450 | 340 | 350 |
| Civil Engineer | 1370 | 1460 | 1510 | 40 | 30 |
| Mechanical Engineer | 2470 | 2760 | 3100 | 330 | 400 |
| Engineering Assistant<br>Mech. Engineer. Tech. | 1970 | 2140 | 2230 | 170 | 150 |
| Mechanical Draftsman<br>Detailer | 2100 | 2650 | 3320 | 550 | 700 |
| Other Draftsmen[2] | 910 | 1040 | 1120 | 110 | 120 |
| Chemical Engineer | 300 | 460 | 490 | 90 | 60 |
| Industrial Engineer | 1630 | 1880 | 2060 | 290 | 290 |

1. Occupations within each technology (elec., mech., etc.) are grouped together, an arrangement similar to that used on the survey form. Employment figures for certain occupations are combined because of possible misinterpretation of specific occupational titles by responding employers.

2. Includes such occupations as Civil & Structural Draftsman, Architectural Draftsman, and Instrumentation Technician.

## APPENDIX H

### SELECTED ENGINEERING & TECHNICAL OCCUPATIONS (Cont.)

SUPPLY

| | Estimated Graduates[1] | | |
|---|---|---|---|
| | 1967 | 1970 | 1972 |
| Electrical Engineering Technicians | 18 | 61 | 78 |
| Electronic Engineering Technicians | 26 | 129 | 178 |
| Electronics Technology[2] | 60 | 300 | 350 |
| Civil Engineering Technicians | -- | 50 | 50 |
| Mechanical Draftsmen[3] | 52 | 154 | 190 |
| Mechanical Draftsmen (Metal Trades)[4] | 14 | 23 | 32 |
| Architectural Draftsmen | 30 | 81 | 91 |
| Instrumentation Technicians | -- | 24 | 32 |
| Mechanical Design (Tool & Die Designing)[5] | 12 | 30 | 40 |
| Chemical Lab Technicians | 5 | 46 | 58 |

[1] Most of the courses include estimates from both public vocational and private training institutions. One area vocational school gave no graduate figures but it does offer blueprint reading and some drafting courses as well as first-year programs in electrical and mechanical engineering technology.

[2] Estimates from one private technical institute.

[3] In addition to figures given, MDTA reported 16 completions for calendar 1967.

[4] Milwaukee Area Apprenticeship Data, completions.

[5] Estimates from one private technical institute.

## APPENDIX H

## SELECTED TRADE & INDUSTRY OCCUPATIONS

| DOT CODE & TITLE | | HEW CODE & TITLE | |
|---|---|---|---|
| 620.281 | Automobile Mechanic | 17.03.02 | Mechanics |
| 807.381 | Automobile-Body Repairman | 17.03.01 | Body & Fender |
| 950.782 | Stationary Engineer | 17.23 | Stationary Energy Sources Occup. |
| 600.280 | Machinist | 17.23.02 | Machine Shop |
| 601.280 | Tool & Die Maker | 17.23.02 | Tool, Die & Methal Patternmakers & Related Occupations |
| 604.380 | Turret-Lathe Set-Up Oper. | 17.23.03 | Machine Tool Operation |
| 609.380 | Engine Lathe Set-Up Oper. | | |
| 605.782 | Milling-Machine Setup Op. | | |
| 619.380 | Punch Press Set-Up Man | 17.23.04 | Metal Fabricating Mach. Operations |
| 619.380 | Metal Fabricator | 17.23.04 | Metal Trades (combined) |
| 810.884 | Welder, Arc | 17.23.06 | Welding & Flame-Cutting Occupations |
| 810.884 | Welder, Gas-Shielded, Arc | | |
| 810.884 | Welder,Hand,Submerged Arc | | |
| 811.884 | Welder, Gas | | |
| 812.884 | Welder, Combination | | |
| 819.381 | Welder-Fitter | | |
| 500.884 | Plater (skilled) | 17.23.99 | Plating Occupations |
| 705.884 | Metal Finisher | 17.23.99 | Metal Finishing Occupations |
| 754.782 | Fabricator, Plastics | 17.27 | Plastics Operations |
| (75-.381 | Plastic/Rubber Molding Mach. Set-Up Op.) | | |
| 787.782<br>786.782 | Sewing Machine Operators | 17.33.99.02.02 | Power Sewing Mach. Occup. |

DEMAND

| | Estimated Employment | | | Est. Replacement and Expansion Needs - Per Year | |
|---|---|---|---|---|---|
| | 1967 | 1970 | 1972 | 1967-70 | 1970-72 |
| Auto. Mechanic (skilled) | 2590 | 2650 | 2800 | 660 | 720 |
| Auto Body Repairman | 800 | 990 | 1100 | 650 | 640 |
| Stationary Engineer & Rel.Occ.[1] | 1820 | 1880 | 1910 | 145 | 140 |
| Machinist | 3310 | 3560 | 3770 | 250 | 280 |
| Tool & Die Maker | 3360 | 3880 | 4160 | 330 | 300 |
| Turret-Lathe Op. | 2650 | 3070 | 3590 | 470 | 590 |
| Engine-Lathe Op. | 900 | 970 | 1020 | 240 | 240 |
| Milling-Machine Op. | 1160 | 1200 | 1290 | 190 | 220 |
| Other Machine Trades[2] | 3180 | 3370 | 3700 | - | - |
| Punch Press Set-Up Man[3] | 1800 | 2130 | 2410 | 540 | 570 |
| Metal Fabricator[4] | 1940 | 2270 | 2400 | 710 | 670 |
| Arc Welder | 4980 | 5390 | 5730 | 970 | 1000 |
| Gas-Shielded Arc Welder | 820 | 940 | 1000 | 270 | 260 |
| Submerged Arc Welder | 170 | 190 | 210 | 70 | 70 |
| Gas Welder | 250 | 260 | 270 | 40 | 40 |
| Combination Welder | 890 | 970 | 1130 | 110 | 140 |
| Welder-Fitter | 470 | 540 | 660 | 110 | 150 |
| Plater (skilled) | 160 | 180 | 190 | 20 | 20 |
| Metal Finisher (skilled) | 480 | 490 | 550 | 200 | 225 |
| Plastic/Rubber Molding Mach. Set-Up Operator[5] | 240 | 480 | 710 | 120 | 155 |
| Sewing Machine Operator[5] | 2340 | 2540 | 2720 | 150 | 170 |

(CONT.)

## APPENDIX H

### SELECTED TRADE & INDUSTRY OCCUPATIONS (Cont.)

SUPPLY

| | Estimated Graduates[9] | | |
|---|---|---|---|
| | 1967 | 1970 | 1972 |
| Auto Mechanics | -- | 35 | 40 |
| Auto Body | -- | 10 | 12 |
| Auto Trades (Auto Mech. & Auto Body Repair)[7] | 2 | 23 | 17 |
| Stationary Engineer [7] | -- | 24 | 24 |
| Machinists [7] | 59 | 103 | 66 |
| " | 18 | 91 | 101 |
| Tool & Die Maker[7] | 30 | 71 | 58 |
| " " | 23 | 82 | 97 |
| Lathe Operators (skilled) | 77 | 80 | 80 |
| Milling & Boring Oper. (skilled) | 6 | 38 | 38 |
| Shapers or Planers (skilled) | 5 | 10 | 10 |
| Machine Tool Operators | -- | 10 | 10 |
| Metal Fabricator, Sheet Metal[7] | 4 | 3 | 3 |
| Arc Welder [8] | 39 | 45 | No Forecast |
| Gas Welder [8] | 11 | No Forecast | |
| Combination Welder[8] | 92 | 160-400 | No Forecast |
| Welders | 12 | 65 | 392 |
| Welders (Welders, Fitters & Fit-Up Men)[7] | 9 | 4 | 6 |

1 Employment figures include some positions of lesser complexity, such as Low and High Pressure Firemen, DOT 951.885.

2 Includes such occupations as: Automatic Screw Machine Operator, Boring Mill Operator, Planer, and Shaper, and Drill Press Operator.

3 These positions are assumed to include several levels of complexity.

4 Includes all types of metal fabricating trades, layout men and template makers, of varying levels of complexity.

5 The occupational title does not appear as such in the DOT. It was used on the survey form as a general, inclusive title covering Plastics Fabricators and certain related plastics and rubber molding occupations. This is an emerging area, and there is uncertainty as to the level of complexity and the implied similarity of the positions included under this title.

6 The great majority of these positions are non-garment sewing machine operators.

7 Milwaukee Area Apprenticeship Data, completions. All other supply figures are from area vocational schools.

8 Supply figures from one area Welding School, a private institution. Explained inability to forecast as follows: "Expect little demand for men with arc welding skill only, by 1972. Do not have gas welding program, but train a few on request. Expansion commensurate with demand for combination welder."

9 Supply table does not include figures for MDTA program completions, calendar 1967. These include: Auto Mechanic-70; Auto Service Station Mechanic-24; Transmission Mechanic-11; Truck Mechanic-1; Auto Body Repair-18; Welders-124. These include both institutional and on-the-job completions.

## APPENDIX H

## SELECTED DATA PROCESSING OCCUPATIONS

| DOT CODE AND TITLE | | HEW CODE AND TITLE | |
|---|---|---|---|
| 012.168 | Systems Analyst, Business-Electronic-Data Processing | 14.02.04 | Systems Analysts |
| 020.188 | Programer, Engineering & Scientific | 16.01.17 | Scientific Data Processing |
| 020.188 | Programer, Business | 14.02.03 | Programers |
| 213.382 | Digital-Computer Operator (Console Operator) | 14.02.01 | Computer & Console Operators |
| 213.382 | Computer-Peripheral Equip.Op. | 14.02.02 | Peripheral Equipment Oper. |
| 213.382 | Card-Tape-Converter Oper. | 14.02.02 | Peripheral Equipment Oper. |
| 213.582 | Key-Punch Operator | 14.02.02.01 (14.09.02) | Key Punch & Coding Equipment Oper. |
| 213.782 | Tabulating Machine Operator | (Related to 14.02.02 and 14.09) | |

DEMAND

| | Estimated Employment | | | Est. Replacement and Expansion Needs - Per Year | |
|---|---|---|---|---|---|
| | 1967 | 1970 | 1972 | 1967-70 | 1970-72 |
| Systems Analyst | 660 | 890 | 1030 | 190 | 180 |
| Programer, Engrg.& Scien. | 40 | 80 | 120 | 50 | 60 |
| Programer, Business | 860 | 1100 | 1260 | 360 | 360 |
| Console Operator | 610 | 800 | 910 | 160 | 150 |
| Peripheral Equip.Oper. )<br>Card-Tape Operator ) | 300 | 350 | 370 | 40 | 30 |
| Key-Punch Operator | 2540 | 2840 | 3090 | 440 | 470 |
| Tabulating Machine Oper. | 300 | 370 | 390 | 80 | 70 |

SUPPLY

| | Estimated Graduates | | |
|---|---|---|---|
| | 1967 | 1970 | 1972 |
| Computer Programing | 250 | 550 | 1050 |
| Data Proc. Technicians - (Business Programers)* | 25 | 50 | 60 |
| Console Operators | 102 | 138 | 170 |
| Console Operators and Peripheral Equip. Op. | 400 | 700 | 1000 |
| Computer Peripheral Equip.Op. | 90 | 110 | 135 |
| Key-Punch Operator | 520 | 750 | 760 |

*Course estimate from one area vocational school. All other estimates supplied by private business or technical schools. The above course listing reflects variation in course content among responding schools.

APPENDIX H

## SELECTED CLERICAL OCCUPATIONS

| DOT CODE AND TITLE | | HEW CODE AND TITLE | |
|---|---|---|---|
| 201.368 | Secretary | 14.07.02 | Secretaries |
| 202.388 | Stenographer | 14.07.03 | Stenographers |
| 203.588 | Typist | 14.09.03 | Typists |
| 209.588 | Clerk, General | 14.99 | Routine General Office Occup. |
| 219.388 | Clerk, General Office | 14.03.03 | General Office Clerks |
| 215.388 | Bookkeeping Machine Operators | 14.01.04 | Machine: Billing, Bookkeeping, & Computing Machine Oper. |
| 207.782 )<br>207.884 )<br>207.885 ) | Duplicating Machine Operators | 14.03.01 | Duplicating Machine Occupations. |

DEMAND

| | Estimated Employment | | | Estimated Replacement and Expansion Needs - Per Year | |
|---|---|---|---|---|---|
| | 1967 | 1970 | 1972 | 1967-70 | 1970-72 |
| Stenographer/Secretary | 10590 | 11420 | 12220 | 1270 | 1390 |
| Typist | 6390 | 7040 | 7830 | 1300 | 1470 |
| Clerk, General* | 10510 | 11340 | 12170 | 1920 | 2060 |
| Clerk, General Office* | 14970 | 16350 | 17100 | 2580 | 2490 |
| Bookkeeping Mach. Oper. | 1780 | 1990 | 2100 | 380 | 370 |
| Duplicating Mach. Oper.+ | 660 | 730 | 760 | 70 | 70 |

*The similarity of titles no doubt resulted in misinterpretation on the part of some employers. It is probable that a good number of the Clerk, General Office positions would more accurately be labeled Clerk, General, an occupation involving fewer, and less complex, duties.

+Includes a variety of duplicating machines, and copiers such as Thermofax and Xerox.

SUPPLY

| | Estimated Graduates* | | |
|---|---|---|---|
| | 1967 | 1970 | 1972 |
| Secretary | 325 | 425 | 505 |
| Stenographer** | 1025 | 1400 | 1720 |
| Clerk, General*** | 5 | 5 | 5 |
| Clerk, General Office | 40 | 50 | 60 |

*Responding vocational and private business schools supplied figures under the above four titles. High schools supplied figures under Stenographer, only. There were no Typist breakouts. MDTA figures were not included in totals since they are available for 1967, only; 1967 completions included Clerk, General Office-53, and Clerk-Steno -14.

**Estimates are understated. Many schools indicated their capacity depends almost entirely on demand, and can be expanded considerably beyond the figures given.

***Many high schools indicated they offer clerical or business courses other than typing and shorthand which would prepare students for general office jobs. It is not possible for schools to enumerate "graduates" in this area, but many students having such courses could fill Clerk, General, positions.

APPENDIX H

## SELECTED HEALTH OCCUPATIONS

| DOT CODE AND TITLE | | NEW CODE AND TITLE | |
|---|---|---|---|
| 075.378 | Nurse | 07.02.04 | Nurse (Assoc. Degree) |
| 079.378 | Licensed Practical Nurse ) | | |
| 354.878 | Practical Nurse ) | 07.02.06 | Practical (Vocational) Nurse |
| 355.878 | **Nurse's Aide/Orderly** | 07.02.05 | Nurses Aide |

demand

| | Estimated Employment | | | Est. Replacement and Expansion Needs-Per Year | |
|---|---|---|---|---|---|
| | 1967 | 1970 | 1972 | 1967-70 | 1970-72 |
| Nurse[1] | 4260 | 5020 | 5650 | 1510 | 1570 |
| Lic. Pract. Nurse )<br>Practical Nurse )[1] | 1400 | 1610 | 1810 | 600 | 630 |
| Nurse's Aide/Orderly | 6490 | 7110 | 6710 | 1840 | 1430 |

1 Primarily General Duty Nurse, but includes others, such as Office Nurse

1 Most positions are for Licensed Practical Nurses.

SUPPLY

| | Estimated Graduates | | |
|---|---|---|---|
| | 1967 | 1970 | 1972 |
| Nurse[1] | 430 | | |
| Practical Nurse[2] | 95 | | |
| Nurse's Aide/Orderly | 120 | 175 | 180 |

1 Figure for 1967 represents actual graduates from area hospitals, technical Institute, and university. In addition, MDTA refresher course for returning RN's reported 44 completions for 1967.

2 Area vocational school graduates.

3 Figures from two area hospitals.

## APPENDIX H

## SELECTED SERVICE OCCUPATIONS [1]

| DOT CODE AND TITLE | | HEW CODE AND TITLE | |
|---|---|---|---|
| 332.271 | Cosmetologist (Beautician) | 17.26.02 | Cosmetology |
| 211.368 | Cashier I | 14.01.03 | Cashiers |
| 299.468 | Cashier-Checker | (Related to 14.01.03) | |
| 223.387 | Stock Clerk | 14.05.04 | Stock & Inventory Clerks |
| 71-.281 | (Mechanical Instrument Repairman)[2] | 17.21.01 | Mechanical, Hydraulic, Pneumatic & Electro-Mechanical Instruments |
| 899.381 | Maintenance Man, Building | 17.10 | Construction and Maint. Trades |
| 382.884 | Janitor | 17.11 | Custodial Services |
| 381.887 | Porters | 17.11 | Custodial Services |
| 311.878 | Waiter/Waitress | 17.29.04 | Waiter/ Waitress |
| 316.781 | Butcher, Meat (hotel & rest.) | 17.29.03 | Meat Cutter |
| 316.884 | Meat Cutter (ret.tr., whole.tr.) | 17.29.03 | Meat Cutter |
| 526.781 | Baker (bake. prod.) | 12.29.01 | Baker |
| 313. 781 | Baker, (hotel & rest.) | 12.29.01 | Baker |

DEMAND

| | Estimated Employment | | | Est. Expansion & Replace.,Per Year | |
|---|---|---|---|---|---|
| | 1967 | 1970 | 1972 | 1967-70 | 1970-72 |
| Cosmetologist | 1840 | 1900 | 1975 | 90 | 110 |
| Cashier I | 710 | 760 | 800 | 100 | 100 |
| Cashier-Checker[3] | 3870 | 3850 | 4440 | 580 | 850 |
| Stock Clerk[4] | 5920 | 6250 | 6790 | 730 | 890 |
| Mechanical Instrument Repairman | 380 | 480 | 510 | 50 | 30 |
| Maintenance Man, Building )<br>Janitor 5 ) | 4980 | 5600 | 6060 | 710 | 730 |
| Waiter/ Waitress | 10620 | 10630 | 10720 | 1160 | 1200 |
| Meat Cutter/Butcher | 1410 | 1280 | 1340 | 200 | 280 |
| Baker[6] | 1460 | 1460 | 1470 | -- | 10 |

SUPPLY

| | 1967 | 1970 | 1972 |
|---|---|---|---|
| Cosmetologist - Milw. Area Apprenticeship Data, Completions: | 17 | 15 | 16 |

One area vocational school graduated 70 in 1967, and has capacity of 88.

Janitor - MDTA, 1967 Completions: 18

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1 This is a rather arbitrary grouping of non-professional occupations in custodial, repair, food and personal services.

2 This title is not found in the DOT and does not pertain to any single DOT occupational definition. It is a rather inclusive title which was used on the survey form.

3 The DOT defines cashier-checker in terms of the check-out counter in self-service stores the title is used here, however, to designate lower-level complexity cashiering positions in other types of retail establishments as well.

4 Includes parts clerks and stock-control clerks, also.

5 Employment figures for Janitor and Maintenance Man, Bldg., were grouped since it was apparent that responding employers defined these terms in various ways. The figures probably include some low-complexity Porter positions, as well.

6 Figures include bakers at more than one level of complexity, including skilled bakers.

## APPENDIX H

## GENERAL

| DOT CODE AND TITLE | | HEW CODE AND TITLE | |
|---|---|---|---|
| 160.168 | Accountant ) | | |
| (160.188) | Junior Accountant ) | 14.01.01 | Accountants, Junior |
| 168.168 | Credit Manager | 04.01.04 | Credit Occupations |
| 16-.--- | Occup. in Administrative Specializations | 04.04 | Marketing |
| 141.--- | Commercial Artists | 17.07 | Commercial Art Occupations |

DEMAND

| | Estimated Employment | | | Est. Replacement and Expansion Needs - Per Yr. | |
|---|---|---|---|---|---|
| | 1967 | 1970 | 1972 | 1967-70 | 1970-72 |
| Accountant | 4470 | 4980 | 5320 | 490 | 490 |
| Junior Accountant | 980 | 1170 | 1220 | 250 | 210 |
| Credit Manager | 340 | 380 | 390 | 160 | 150 |
| Marketing Administration[1] | 2320 | 2610 | 2670 | 300 | 240 |
| Commercial Artist | 200 | 280 | 350 | 50 | 60 |

[1] This very general grouping was used in the survey at the suggestion of vocational educators as an attempt to relate a variety of positions to the broad curriculum area defined as "Marketing".

SUPPLY

| | Estimated Graduates | | |
|---|---|---|---|
| | 1967 | 1970 | 1972 |
| Accountant[1] | 80 | 100 | 120 |
| Jr. Accountant[1] | 30 | 35 | 45 |
| Bkkrs. and 2-Yr. Accounting | 70 | 110 | 150 |
| Bus. Adm. (Fin., Gen. Bus., Real Estate & Marketing) | 60 | 80 | 90 |
| Marketing Adm. Occup.[1] | 80 | 100 | 120 |
| Marketing & Retailing | 30 | 50 | 75 |
| Commercial Art | 12 | 30 | 34 |

[1] Private business school estimates. All others are are vocational school estimates. The above course listing reflects variation in course content among responding schools.

The GENERAL grouping includes a small selection of professional level jobs in occupational areas not elsewhere classified.

APPENDIX H

## SELECTED PRINTING AND PUBLISHING OCCUPATIONS

| DOT CODE AND TITLE | | HEW CODE AND TITLE |
|---|---|---|
| 971.381 | Photoengravers | |
| 971.381 | Strippers | 17.19 Lithographic, Photographic & Platemaking Occupations |
| 972.381 | Transferrers (Platemakers) | |
| 971.382 | Photographer, Photoengraving | |
| 972.382 | Photographer, Lithographic | |
| 651.782 | Offset-Press Man (Lithographic Pressman) | |
| 651.782 | Cylinder-Press Man | |
| 651.782 | Platen-Press Man | 17.19 Printing Presswork Occupations |
| 975.782 | Stereotyper | |
| 650.582 | Linotype Operator | |
| 650.782 | Photocomposing Mach. Oper. | 17.19 Composition, MakeUp & Typesetting Occupations |
| 973.381 | Compositor | |
| 973.381 | Job Printer | |

DEMAND

| | Estimated Employment | | | Est. Replacement and Expansion Needs - Per Year | |
|---|---|---|---|---|---|
| | 1967 | 1970 | 1972 | 1967-70 | 1970-72 |
| Photoengravers | 600 | 630 | 680 | 30 | 40 |
| Strippers | 150 | 170 | 190 | 10 | 10 |
| Platemakers | 350 | 380 | 410 | 10 | 20 |
| Photographer, Photoengrav.<br>Photographer, Litho. | 250 | 280 | 320 | 10 | 20 |
| Offset-Press Man | 580 | 700 | 780 | 40 | 40 |
| Cylinder-Press Man | 500 | 550 | 580 | 50 | 50 |
| Platen & Rotary Pressmen | 90 | 120 | 160 | 10 | 20 |
| Stereotyper | 100 | 120 | 150 | 20 | 20 |
| Linotype Operator | 370 | 440 | 480 | 40 | 40 |
| Photocomposing Mach. Op. | 40 | 90 | 130 | 20 | 20 |
| Compositor | 1020 | 1100 | 1100 | 80 | 60 |
| Job Printer | 210 | 260 | 310 | 40 | 40 |

SUPPLY

| | Estimated Graduates | | |
|---|---|---|---|
| | 1967 | 1970 | 1972 |
| Photoengravers* | 1 | - | - |
| Lithographic Platemakers | - | 9 | 9 |
| Lithographic Cameramen | - | 5 | 7 |
| Lithographic Artists | - | 7 | 7 |
| Offset-Press Man | - | 15 | 15 |
| Lithographic -Press Man | - | 15 | 15 |
| Pressmen, Letterpress | - | 11 | 12 |
| Lithographers (Litho. Press)* | 54 | 29 | 47 |
| Compositors* | 3 | 4 | 5 |

*Milwaukee Area Apprenticeship Data, Completions. All other data from vocational school apprenticeship program and adult school program. In addition, MDTA reported 16 OJT completions in 1967 for "Lithographic Workers".

APPENDIX H

MDTA COMPLETIONS -- CALENDAR 1967 -- Occupations related to preceding demand-supply data.

| Occupational Grouping | INSTITUTIONAL |  |  | OJT |
|---|---|---|---|---|
|  | Completions | 1st Hires | Training Related | Completions* |
| Engineering & Technical |  |  |  |  |
| Mechanical Draftsman | 16 | 6 | 5 | -- |
| Trade & Industry |  |  |  |  |
| Machine Operator | 130 | 74 | 67 | 53 |
| Machine Shop Inspector | 8 | 6 | 5 | -- |
| Tool & Die Maker | -- | -- | -- | 1 |
| Auto Body Repair | 8 | 5 | 4 | 10 |
| Auto Mechanic | 35 | 27 | 23 | 35 |
| Auto Service Station Mech. | 24 | -- | -- | -- |
| Transmission Mechanic | 11 | 9 | 8 | -- |
| Truck Mechanic | -- | -- | -- | 1 |
| Welder | 124 | 49 | 39 | -- |
| Clerical Occupations |  |  |  |  |
| Clerk, General Office | 53 | 32 | 31 | -- |
| Clerk-Steno | 14 | 10 | 10 | -- |
| Health Occupations |  |  |  |  |
| Nurse, General Duty (Refresher Course) | 44 | 29 | 29 | -- |
| Service Occupations |  |  |  |  |
| Janitor | 18 | 13 | 9 | -- |
| Printing & Publishing |  |  |  |  |
| Lithographic Worker | -- | -- | -- | 16 |

*All OJT completions are also first hires in training related work. (To enroll, a trainee must already be hired by an employer, and the work must obviously be in the field for which he is to be trained.)

# APPENDIX I

## PUBLICATIONS RELATED TO UNFILLED OPENINGS--OCCUPATIONAL OUTLOOK HANDBOOK TECHNIQUE

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A Short-Cut Technique for Making Local Long-Range Occupational Projections: The ES Unfilled Job Openings-Occupational Outlook Handbook Approach I- 2

Addendum (to the above publication) I-13

Occupational Employment Information for the Milwaukee Job Market Area -- Proposed Format for Occupational Employment Information Reports I-25

APPENDIX I

Draft

# A SHORT-CUT TECHNIQUE FOR MAKING LOCAL LONG-RANGE OCCUPATIONAL PROJECTIONS: THE ES UNFILLED JOB OPENINGS-- OCCUPATIONAL OUTLOOK HANDBOOK APPROACH

Wisconsin State Employment Service
Madison, Wisconsin
May 1967

APPENDIX I

(A Short-Cut Technique for Making Local Long-Range Occupational Projections: The ES Unfilled Job Openings-Occupational Outlook Handbook Approach) - Continued

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## APPENDIX I

# A SHORT-CUT TECHNIQUE FOR MAKING LOCAL LONG-RANGE OCCUPATIONAL PROJECTIONS: THE ES UNFILLED JOB OPENINGS-- OCCUPATIONAL OUTLOOK HANDBOOK APPROACH

## Introduction

This Manual describes a methodology for making long-range occupational forecasts, which is one of several techniques under consideration by the U.S. Department of Labor. For some time, there has been a need for a practicable forecasting technique which also meets the criteria of being inexpensive, not too time-consuming, and statistically sound. This new technique is an effort to replace the traditional, costly, time-consuming area skill survey program upon which the Employment Service system has relied for the past ten years to provide comprehensive information in individual labor areas of current employment and future labor requirements, by specific occupations. Such information is essential to the understanding of the operation of the job market, and has many important operational uses in vocational education and MDTA training programs, employment counseling, job development, community employment development, employer services, and civil defense planning.

The new and greater responsibilities for the development of State and area manpower projections placed upon the Employment Service by the manpower legislation of the 1960's has intensified the need for a new, short-cut approach to long-range forecasting. Under the Vocational Education Act of 1963, in particular, the Employment Service system has been given a mandate to provide job market information to the vocational school system which would serve as a basis for undertaking a vastly expanded program of vocational training which will involve the Federal and State governments in a matching program of hundreds of millions of dollars annually. It is clear that the State Employment Services, with no additional funding, and with only the traditional and costly skill survey technique available to them, are in many instances unable to cope with the informational requirements made by the provisions of this law. It is therefore necessary to develop a new technique for this purpose.

Among the several proposed new techniques for long-range occupational forecasting is that described in the article entitled "Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting" by Norman Medvin, which appeared in the January-February 1967 issue of the EMPLOYMENT SERVICE REVIEW. It is in connection with this proposed technique that the following manual is written.

In April 1967, an agreement was reached between the Bureau of Employment Security and the Office of Manpower Planning, Evaluation, and Research (OMPER) for the testing of this technique, knowmas ES Unfilled Job Openings -- Occupational Outlook Handbook approach (in subsequent years, its name might change to the Job Vacancy -- Occupational Matrix approach since these two components will be the improved versions of the earlier elements), as part of the project VISION program funded by OMPER for the testing and evaluation of various methods leading to the development of occupational information for implementation of the Vocational Education Act of 1963. The test was conducted in the city of Milwaukee, Wisconsin. Following completion of this experiment, two products have evolved:

1. The findings of the Milwaukee survey and recommendations to the State Board of Vocational Education. Copies of the report were distributed to all State agencies via the Research Transmittal Series, dated ; and

2. The subject how-to-do-it Manual, also prepared for distribution to the States. This Manual is designed not only to illustrate the simplicity of the methodology, but also to serve as a format for further testing of this technique in six other areas.

On the basis of the following criteria, three types of areas will be selected to further test the "Medvin Approach":

1. Areas which have conducted job vacancy surveys.

2. Areas which have NOT conducted job vacancy surveys, and in which the number of job orders placed with the Employment Service appears to be LARGE in relation to all vacancies in the area.

3. Areas which have NOT conducted job vacancy surveys, and in which the number of unfilled job openings listed at the Employment Service appears to be SMALL in relation to all vacancies in the area.

The following procedure is designed to provide specific, step-by-step guidelines to the analyst to conduct this study. While recognizing the need for specificity, the guidelines are also designed to provide maximum flexibility to the analyst, and to incorporate and promote the analytical input and experience of the Employment Service staff.

The procedure involves the collection and treatment of local Employment Service data on unfilled and hard-to-fill job openings; the use of job vacancy data where available; the collection of data on occupations in which Employment Service job openings are not representative; and the packaging of these data.

(Special Note on Uses of Information -- Although the experience in the Milwaukee test focused on developing information for vocational education purposes, the data resulting from this technique are equally useful for MDTA purposes, including development of the MDTA annual plan and training needs determination. This application to MDTA purposes can be achieved merely by including lesser skilled occupations which are not of import for normal vocational education needs.)

A. Coverage

Surveys may be conducted for any geographic area or unit for which local Employment Service job openings data are available (any loca office) and for areas for which such orders can be aggregated (SMSA's, States, etc.).

B. Collection of Local Office Unfilled Openings Data

The initial step in the procedure involves the collection, organization and analysis of local office unfilled job openings data.

1. Collect quarterly figures for the last 4 quarters, or more as available, on total unfilled openings listed with the local Employment Service office, and openings on file for 30 days or more. Use Form ES-240 data where available. If possible collect data by six-digit DOT code; if not, by three-digit DOT code.

2. Prepare a worksheet, listing in the stub in DOT numerical order, all occupations found in the above step. Show all 3- and 6-digit occupations. Separate by major occupational groups. In the caption of the worksheet list the quarterly time periods.

3. Compute for each occupation and occupational group, the percent of unfilled openings on file 30 or more days ("hard-to-fill" openings) to the total openings in each quarter.

4. Scan list for all quarters (when they exist), and select occupations in which at least 30 percent of openings are on file 30 or more days for at least two of the four quarters in a year. Occupations with common skills should be clustered so that a skill scattered among a number of occupational codes is not under-represented. For example, the job openings data may show 15 openings for "Account clerks" and another 15 for "Bookkeepers and related." These similar jobs can be aggregated to show 30 openings to reflect the true magnitude of demand for these skills. In some cases, one occupation may contain by far the most openings in the cluster. For example, job openings data may show 5 openings for "Account clerks" and 25 openings for "Bookkeepers and related." In such instances, based on the analysts' judgment, the "Bookkeepers and related" occupation should be broken out so that its importance might be given proper recognition.

5. Categorize the occupations selected in step 4 above into three or four class intervals, using the absolute number of hard-to-fill openings as a criterion. The categories may be modified to the needs of different locale Examples might be "over 100; 20-99; under 20" or "over 100; 60-99; 30-59; under 30." For purposes of categorization, use the average number of job openings for all four quarters.

6. Use both the estimated number of hard-to-fill openings (step 5) and the percent of openings unfilled 30 days or more (step 3) to select key occupations and establish a priority list.

## C. Supplement by Inclusion of Occupations of High Employment

To cover those occupations in which there is a considerable number of workers in the area, and which do not show up in the hard-to-fill listings, the decennial census should be examined. Since such occupations generate replacement needs, training may be needed even without long-term growth.

1. In examining census occupational counts the analyst should look for specific occupations (i.e., not occupational groups or grouping titles, such as "Other clerical" or "Foremen, n.e.c.") in which total employment is highest.

2. If these high employment occupations have no hard-to-fill history, the "Occupational Outlook Handbook" (OOH) outlook should be used to determine whether the occupation should be listed for training. (See below, item E, for discussion of use of OOH.)

   If the outlook is for growth, we would recommend continuance of the vocational education classes in the locality. If the occupational outlook is for neither growth nor decline, we would also continue training but watch vocational education and Employment Service placement experience carefully. If, on the other hand, the prognosis was for a decline nationally and there was not a hard-to-fill experience locally, we would recommend contraction of training in the absence of other extenuating circumstances.

3. If these occupations duplicate those already listed because of a hard-to-fill history, they present no problem.

## D. Job Vacancy Data

In those areas for which job vacancy data are available, these data are to be used in conjunction with job openings as is outlined below. In areas in which job vacancy studies have not been conducted and data are not available, the following steps must be omitted. In this latter case no inflation factor will be available for job openings data and the analyst should stress, both in his analysis and presentation, that survey findings represent a minimum of job openings, both for the area and for the local office--this latter due to local office practices in recording job orders and openings. (Note: Even if a job vacancy blow-up factor is available, the resultant figure will still be a minimum because it is still based on the job opening figure which has a downward bias.)

1. Secure job vacancy data where available. Ideally the vacancy survey should correspond to one of the Employment Service unfilled opening surveys, e.g., month of April.

2. Take the ratio of total job vacancies to total Employment Service unfilled openings for a given month. This is done in order to secure a blowup factor:

1

$$\frac{\text{Vacancies Listed}}{\text{Employment Service Unfilled Openings}} = \text{blowup factor}$$

Example: For a hypothetical 3-digit DOT occupation, unfilled openings (Employment Service) equalled 84 in April, 1965. Total vacancies for the same month in the area was 143. Therefore, in order to secure a blowup factor for a like period we would divide 143 by 84. This would give us a blowup factor of 1.7. In other words, approximately 59 percent of all vacancies in a given month for the 3-digit DOT occupation were listed with the Employment Service. If Employment Service unfilled openings are collected four times a year, it is suggested that an average of four unfilled openings figures be substituted in the denominator of the blowup factor ratio for the one month period. In the example of the 3-digit occupation it may be found that the average of the four quarterly periods equalled 94. In this case $\frac{143}{94} = 1.5$.

The blowup factor is somewhat smaller and consequently the estimated universe of hard-to-fill openings would be slightly smaller. Only experience over a period of years involving a number of randomly chosen occupations can affirm as to which alternative blowup factor is desirable.

3. Multiply Employment Service unfilled openings of 30 days or more by the blowup factor of 1.7 (or 1.5) to secure estimate of all hard-to-fill openings in the occupation.

4. Rather than use actual numbers resulting from this computation, use categories for the estimated universe of hard-to-fill openings, as discussed above, e.g., under 30, 30-59, 60-99, 100 or over.

5. For occupations with strong seasonal patterns of job openings, do *not* apply the blowup factor if the job vacancy data comparison period is outside the seasonal peak.

### E. Prognosis Using Occupational Outlook Handbook

Arrangements are being made to provide easily usable materials, based on the OOH, for reference in categorizing long-term occupational growth. A list of over 75 occupations, grouped into categories of rate of increase (rapid, moderate, etc.) is now available from BLS on an individual request basis. The planned BLS publication, *Tomorrow's Manpower Needs*, will contain much additional data on projected rates of increase for individual occupations.

1. For immediate needs the analyst should use the attached *Occupational Outlook Handbook* prognosis for long-term occupational growth.

2. Refer to the prognosis of the 3-digit DOT occupations in the *Occupational Outlook Handbook*, and the limited number of occupations listed in the Department of Labor's *America's Industrial and Occupational Manpower Requirements 1964-75*. Most frequently, statistical data on the size of the projection are not presented in the *Handbook*. In such cases the words "rapid," "moderate," "slow," etc., describe the projection. These categories may be interpreted as follows: a) rapid increase, 25 percent or more (for 1964-75 period); (b) moderate increase in employment,

15.0 to 24.9 percent; c) slow increase, 5.0 to 14.9 percent; d) no change, less than 5 percent; and e) decline, 5 percent or more percent decrease in employment.

It should be noted that in the Wisconsin Project VISION test, long-range employment projections were obtained from the OOH for each of the 3-digit occupational groups. Various difficulties were encountered in obtaining the projection data depending on the complexity and/or skill level of the 3-digit occupational groups. However, the major difficulties were incurred because the OOH offers only limited data for occupations at the lower skill level. Much of this information i very general or exists only for occupational clusters. An effort was made to adjust to the OOH by rearranging unfilled openings data to coincide with the OOH clustering whenever possible. For example, in the Milwaukee, Wisconsin test the job openings data based on DOT second edition codes "Stenographers and Typists" were grouped together (DOT 1-37). The OOH groups "Stenographers and Secretaries" together and breaks out "Typists." Also, the BLS publication America's Industrial and Occupational Manpower Requirements 1964-75 was used as a supplement to the OOH data in order to clarify specific projections and fill information gaps.

3. Discard occupations in which long run projection is "no change" or "decline" except for those in which many opportunities occur because of high replacement or special circumstances applying to occupations in area (see section C, page 4).

## F. Treatment of Occupations Needing Further Study

1. Select any occupation or occupational clusters that may require further investigation, either by checking office records or through visits to employers, unions, or associations; or as evidenced by Employment Service openings as a proportion of the universe of job vacancies. This is the study of the so-called "gap" areas, i.e., occupations under-represented in Employment Service order files.

2. For occupations needing further study, the approach suggested is as follows:

   a. Appraise occupational gap areas as to the reasons for investigations such as hiring through the union hall, placement through professional associations, or other non-Employment Service hiring methods. Judgment is also made as to seasonability, high turnover, low skill, and poor image types of occupations.

   b. A conference with local office labor market specialists should be arranged for discussion of the gap areas. Historical treatment of certain occupations, industries and selected firms by local office operations can then be reviewed and evaluated by the specialists. Judgments can then be made in respect to certain job categories and/or industry job market actions.

   c. Interview referral people who have extensive industry and/or occupational experience. These people are able to bring further insight into the workings of the job market, regarding selected gap areas, i.e., what changes might be occurring, if any, since the data was gathered, what reasons employers might be giving for little Employment Service participation in a given labor market transaction, why certain data on the gap study seems quite out of balance, and any further comments that seem germane to the problem at hand, especially to its solution.

d. Review the DOT and the closed order files for further identification of gap occupations, and industrial transactions occurring in this area during the preceding year. The gap study does lump skilled and semi-skilled occupations together, and also includes n.e.c. categories, which makes it difficult in some situations to determine the occupation involved.

e. Study the news ads job listing for successive Sundays to determine the possible source of recruitment, i.e., the firms that might be a source. Some firms refuse to register with the Employment Service.

f. Search the local office applicant file for determination of any information on supply of a given gap occupation. This cursory study did give informational background for purposes of possible discussion with employers. However, specificity may not be attained because of the indefiniteness of the actual occupation, or level.

g. Spot check vacancy studies, if available. This is useful especially in determining the course of action to take for those occupational areas that indicate very high vacancies. This could be done by looking at the questionnaire of selected firms which might have shown a large number of vacancies in a given occupation, thereby obviating the need for further internal search as to the source of information for gap occupations. The perusal of these questionnaires may prove to be fairly informative in planning the course of individual contacts to be made.

h. Study the vocational school curriculum to be informed on course offering, apprenticeship training, length of learning time in the various occupational areas, requirement for entry into a course offering, and other data. This knowledge proves useful in speaking to employers about vocationally-oriented jobs.

i. Finally, select the firms, unions, employer associations, schools and individuals in the community who appear best suited to supply the missing data. This selection will be a culmination of the information-gathering described above.

j. Make appointments with representatives of employers, unions and associations. An explanatory letter including the information needed and reasons we are requesting it should be sent out previous to the visit. In that way the employers can be prepared to provide the required data.

Ideally, associations or unions can provide an overview of an occupational need in the community. However, they may be hesitant in supplying definite figures. In some cases a few large employers may provide sufficient information on an occupation; e.g., most electronics technicians were employed in relatively few firms in Milwaukee and so personal visits to those employers were sufficient.

## G. Clustering Comparability

A major difficulty in the past in establishing a dialogue between the Employment Service and Vocational Education authorities has been the lack of a common occupational nomenclature between the instructional programs and the DOT classifications. A joint effort of the USES, the Office of Education, and the Wisconsin State Employment Service, directed toward producing a comparability table, has been completed. The following paragraphs will provide a short discussion of the various aspects of the system and demonstrate the significance of such clusters in terms of data interpretation and presentation.

The basic principle behind the development of this clustering system is the grouping of occupations with a common core of skills or dealing in a similar body of knowledge. Such a body of knowledge consists of the skills, abilities, and technical capacity that enables a person to function effectively in a given occupation. Hopefully, a single instructional program could provide an individual with the necessary core of knowledge for entry into any one of the occupations within the group or cluster.

The HEW clustering system is in outline form, graduating from broad generality to increased specificity in terms of job knowledge and specialization within a field. The appropriate cluster was selected on the basis of similarity of job knowledge required for each DOT title. The DOT title was then related to the degree of specificity that reflected the most desirable level of specialized training.

The DOT definitions lend themselves to classification by knowledge applied because the definitions have been written to reflect such information as skills, abilities, and the technical knowledge involved in adequate job performance. Due to this fact, every effort was made to adapt the present DOT structure into the curriculum clusters. This does not necessarily mean that every DOT title and definition was classified. Many DOT titles and definitions are intended to describe a specific technique as it exists in a given establishment or industry.

Those DOT titles used were selected on the basis of offering the broadest definition and application of a given occupation. (To include many other titles which cover only a limited aspect or application of an occupation would not serve a useful purpose.) Also, those occupations requiring no significant formal training, i.e., those which are routine or manual in character, have not been listed under any instructional program.

This cluster information is to be used merely as a method of presenting data to vocational schools. The intent of this method of presentation is to clarify the occupational information and eliminate the misconceptions that have limited the usefulness of such data in previous years. Each occupation is associated with a curriculum description in presenting the data to vocational schools. The only operation necessary is to locate the specific DOT title, code, and its corresponding curriculum description. The data is then arranged and grouped according to these clusters for presentation to vocational educators.

The manner in which DOT titles are tied to the vocational education instructional program is shown by the illustration below. The vocational education instructional program for "Plastics occupations" is defined as "classroom and shop learning experiences dealing with plastics and their characteristics, with bench molding, fitting, internal carving, and finishing and fiber glass materials into products. Instruction includes using hand and power tools." The DOT titles (third edition) which fit into that program are as follows:

| DOT Code | Occupational Title |
|---|---|
| 553.884 | Heat welder, plastics |
| 556.780 | Mold setter |
| 556.782 | Arch-cushion-press opr. |
| | Compression-molding-machine operator |
| | Injection-molding-machine operator |
| | Plate molder |
| 556.885 | Compression-molding machine tender |
| 556.885 | Injection-molding-machine tender |
| | Molder, pipe covering |
| | Pilling-machine operator |
| | Vacuum plastic-forming-machine operator |
| 557.782 | Extruder operator |
| | Wink-cutter operator |
| 559.885 | Foam machine operator |
| 575.782 | Fiberglass-dowel-drawing-machine operator |
| 590.887 | Plastic-joint maker |
| 601.381 | Plastic tool maker |
| 690.885 | Tube molder, fiberglass |
| 691.782 | Extruding-machine operator |
| 754.381 | Internal carver |
| | Plastics bench mechanic |
| 754.884 | Assembler and gluer, laminated plastics |
| | Caster |
| 754.884 | Laminator, preforms |
| | Mold laminator |
| | Plastic lay-up man |
| | Plastics fabricator |
| | Repairman |
| 777.381 | Ear-mold laboratory tech. |
| 779.884 | Plastic molder |

The comparability table is still in draft form and as of this writing, copies are not available for wide distribution. Should a State agency wish to make use of this table, requests for copies should be addressed to the Bureau of Employment Security, United States Employment Service, Attention EMTO.

## H. Preparation of Materials for Vocational Education and MDTA

Preparation for, and presentation of data and findings to users is obviously essential to completion of this approach. However, except for the few specialized treatments of data suggested above (clustering comparability; categorizing into groups of "over 100," "60-99", etc.), presentation of these materials should follow standard techniques of analysis, preparation, and packaging.

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NOTE: PROJECT VISION has been informed that publication of the comparability material--"The Occupational Cluster Reference Guide"--is tentatively set for mid-1969. For information, refer to U.S. Office of Education, Division of Vocational and Technical Education.

APPENDIX I

# ADDENDUM TO
# A SHORT-CUT TECHNIQUE FOR MAKING LOCAL LONG-RANGE OCCUPATIONAL PROJECTIONS:
# THE ES UNFILLED JOB OPENINGS--OCCUPATIONAL OUTLOOK HANDBOOK APPROACH

Project VISION
Wisconsin State Employment Service
Madison, Wisconsin
June, 1967

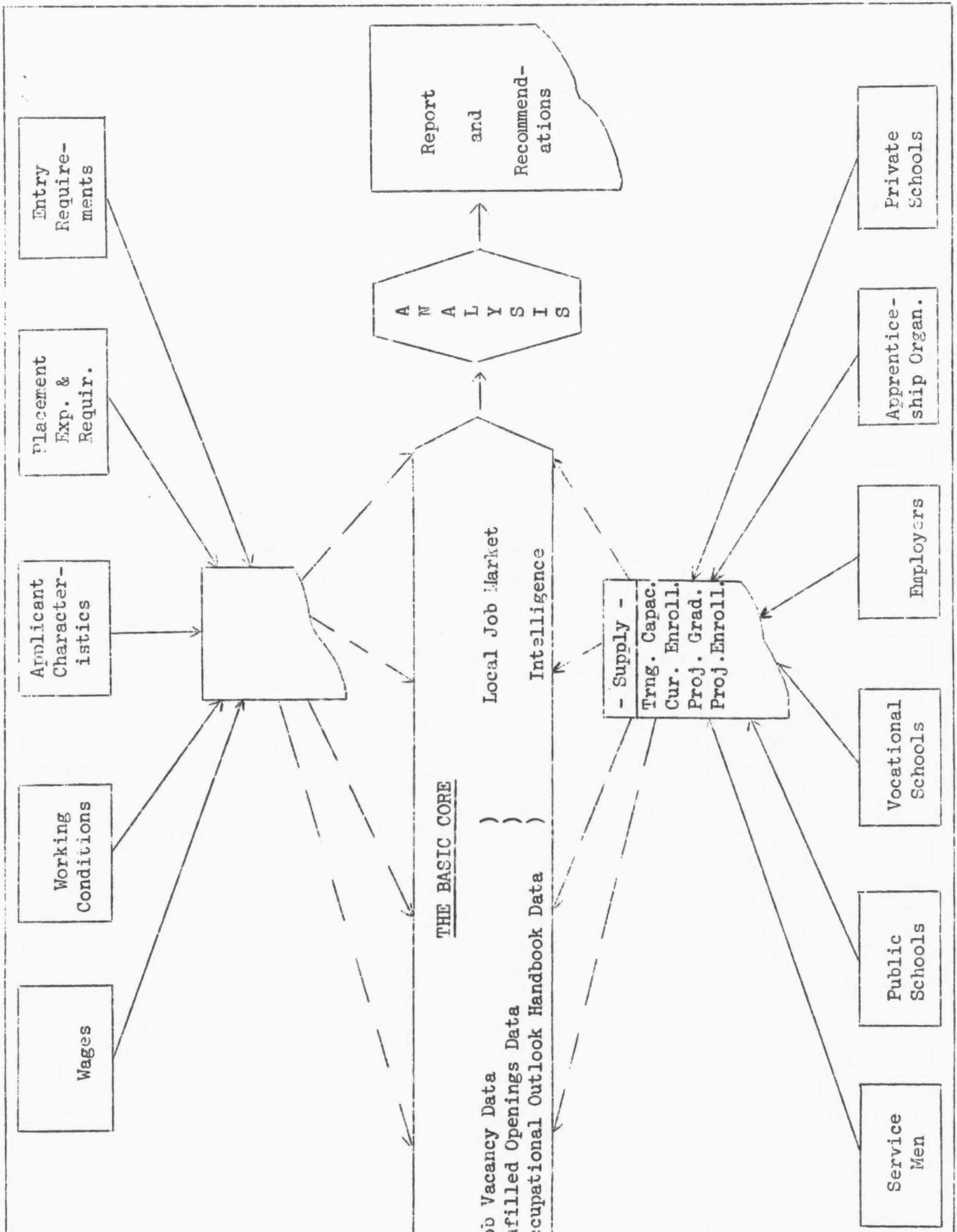
APPENDIX I

The material presented in the following pages is not part of, nor contemplated by, the Unfilled Opening - Occupational Outlook Handbook technique as proposed by Mr. Medvin. Instead, it is an amplification of this technique which is deemed necessary by Project VISION staff who were involved in preparing this report.

It is the opinion of the Project VISION staff that when data on supply determinants are collected and analyzed by key occupations, vocational and other manpower training agencies are in a position to gauge their own potential contribution in eliminating shortages in the labor market and in assisting individuals in acquiring required skills more effectively. In order to avoid a large over or under response to the actual needs of employers a concise evaluation of the interaction between demand for labor (estimated universe of hard to fill openings) and the determinants of the labor supply for specific occupations is needed. We therefore feel it necessary to add a supplemental manual on (1) the identification of factors which determine supply and (2) the uses to which such data could be put by employment services and manpower training agencies in determing training needs.

APPENDIX I

Outline of Information Inputs


Entry Require- ments
Placement Exp. & Requir.
Applicant Character- istics
Working Conditions
Wages
Report and Recommend- ations
A N A L Y S I S
Local Job Market Intelligence
THE BASIC CORE
Job Vacancy Data
Unfilled Openings Data
Occupational Outlook Handbook Data
- Supply -
Trng. Capac.
Cur. Enroll.
Proj. Grad.
Proj.Enroll.
Private Schools
Apprentice- ship Organ.
Employers
Vocational Schools
Public Schools
Service Men

APPENDIX I

I. Identify and collect data on the determinants of supply for given occupations. The basic determinants of the supply of labor for specific occupations are: wages, working conditions, applicant characteristics, placement experience, entry requirements, inmigration and outmigration data (if possible) and educational facilities.

1. Educational facilities - One means at hand in measuring the adequency of present facilities is to estimate the training capacity and the current, recent past, and projected enrollments and the number of graduates of secondary schools, vocational schools, employer training programs, apprenticeship organizations and military service specialized training programs.

2. Wages: This includes the entry, median, mean, and the mode wage rates by occupation. The sources of this information (in the State of Wisconsin) were the area wage survey, bulletin #46561, the Bureau of Labor Statistics, and the survey of wage rates in selected occupations, the Research and Statistics unit of the Wisconsin State Employment Service.

3. Working conditions and physical demand. The source used was the Selected Characteristics of Occupations, A Supplement to the Dictionary of Occupational Titles, third edition, 1966.

4. Applicant characteristics and entry requirements, a) as required by employers (source of information - Employment Service order statements and the DOT supplement), and b) as required for admission to a particular school curriculum. We would be interested in the general level of educational attainment. One measure of this would be the number of years of high school math, science, shop courses, etc. required. The source of this information would be the school curriculum catalogue.

In a tight labor market it might be difficult to match the required number of students enrolled in a specific school curriculum with a hard to fill occupation. It would obviously be misleading under these circumstances to recommend to vocational schools that they train an additional one hundred students or so, based solely on the fact that one hundred could easily be placed into the labor market. A concise analysis or check aganist employment service order statements, may show that the highest percentage of openings exist for highly experienced people or perhaps for those holding a two year associate degree, etc. Under these circumstances we would have to be assured that a sufficient number of potential students possessing the required aptitudes necessary to complete the given program were available and interested.

5. Placement experiences: a) for percentage of graduates that are placed, and b) for the percentage of total enrollments in any one year that are placed. Sources of information are the respective schools.

All determinants so far referred to must be examined with the intention of discovering the contributing cause or causes of the inadequate supply.

II. Uses to which the data are put in determing training needs for specific occupations.

First we should evaluate the extent to which the size, and content of the present educational facilities contribute to the occupational shortage. Ideally, we would like to secure information on:

1. Past enrollments in the various training institutions for at least a year and if at all possible two years, and present and anticipated enrollments.

2. Past, present and future graduates from the various vocational educational programs.
3. Part time employed students, full time employed students, unemployed students, and the number of trainees enrolled who are part of an apprenticeship training program.
4. The percentage of drop outs, especially those who enter the field that they began to train for and
5. The approximate percentage of graduates that leave the locale in which they have trained.

The actual steps involved in acquiring enrollment information, time involved, the ease with which a communication channel is instituted and the degree of response, will no doubt vary from one locale to another, and from one occupation or educational institution to the next, especially in the initial contact. What follows is a brief resume on the steps taken and consequently the experience of the local employment service labor analysts in requesting and acquiring the required data.

A local labor analyst in Milwaukee contacted the secondary schools, vocational schools, employer training organizations and apprenticeship organizations. He contacted the administrative counselor - Instructor of the Milwaukee Vocational Technical School. Any existing data were made available. The president of a private school of engineering contacted the various information centers himself and secured the necessary data. In the secondary schools the supervisor of the secondary curriculum secured information. At the Milwaukee Institute of Technology the faculty advisor became our liason. Within one to three days after a phone call was initially made to the above institutions, personal contact was made and information secured. The number of past enrollments for a two year period, present and anticiptted enrollments and the number of graduates were collected.

Data on drop outs by curriculum exist in some institutions and not in others. Data on placement of graduates vary from one school to the other. Follow up studies on former students were few and far between. However, many of the vocational school representatives expressed a sense of frustration at these states of events. Measures are being taken by at least half of the institutions to correct this information gap. Information as to how many drop outs actually enter the field that they have received some training for is indeed scanty.

The labor analyst making the initial inquiry felt that all available information for the various training institutions in Milwaukee for twenty or more hard-to-fill occupations could be collected within a two week period using one employment service labor analyst familiar with the particular locale.

Next we should relate the supply data to the hard-to-fill openings. Only then can conclusions as to future occupational training requirements for local areas be made.

Illustration:

For a three digit DOT occupation 000 we found the average estimated universe of hard-to-fill openings for a four quarter period to equal 100. The estimated number of trainees from all educational programs within the locale that entered the local labor market in the specific occupation equals

250.[1] Total employees in the specific locale in occupation 000 equals 5000. The prognosis for the next few years adjusted for trends unique to the given locale is that demand for labor within this occupation will grow at an average annual rate of three percent. The anticipated increase in total enrollments and the total number of graduates from this year to the next is the same for the last, approximately five percent. At least one half of all new employees were expected to replace those who retired, died or left the occupation for other reasons (for the period 1965-75).[2] Therefore, an additional 150 employees would be needed because of replacement needs.

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[1] It is not simply the total number of percent of anticipated graduates that determines the efficacy of present educational institutions in meeting present and anticipated demands. The number of trainees who do not complete a program but enter the particular labor market are as important. We estimated that the total number of trainees entering the labor market was equal to 250. We secured this figure by subtracting from the total enrollments the estimated number of trainees already employed in the given or allied occupations, the number of apprenticeship trainees, and the number of drop outs that were not expected to enter the local labor market in the specific occupation. The existence or availability of such data varied from occupation to occupation and type of educational institution. Both local and State vocational educators seemed willing to collect such information when possible in the future. The initial time and energy spent in collecting and analyzing such data would no doubt be considerable. However, we do feel that much less time or effort would be needed to revise the information in the following periods. It should be pointed out that this information would be collected for the relatively few occupations in which a moderate to critical shortage exists, both for the present and the future.

[2] We should avoid applying an overall labor force replacement rate to any particular occupation if at all possible. Retirement and death rates do vary from one occupation to the next. Replacement rates, especially for women differ according to the educational level attained. The participation rate in the labor force of professional women tends to be larger than for non-professional women, etc.

If comprehensive data on retirement and death rates for individual occupations exist, they should be used. In the more likely event that they don't exist for the majority of three-digit DOT occupations, a systematic method based on tables of working life will yield the approximate magnitude of replacement needs resulting from retirements and deaths. There are three main ways used to determine replacement needs.

If we were to assume that the economy would grow at the same pace or slightly under that of the recent past, approximately three hundred additional employees would be required to meet present needs.

We first estimated that one hundred and fifty trained personnel were needed as a consequence of an estimated increase in demand of three percent (A 3% annual growth rate times the total estimated number of employees in occupation 000, of 5000 found in the Milwaukee SMSA equals one hundred and fifty.) We then added the one hundred and fifty individuals required because of replacement needs. Consequently the total need was equal to an approximate number of three hundred.

In determining whether or not the present and anticipated training facilities adequately meet present needs, data on net inmigration - outmigration into the particular locale for critical occupations as well as occupational shifts or transfers of individuals from one occupation to another would be invaluable.[3]

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(footnote 2 continued from page 5)
The third method preferred by our staff, is based on tables of working life. The tables are set up on an acturarial basis for both male and females. Usually 100,000 people "born alive" are selected. The tables follow the group through successive ages from 14 years of age on for withdrawals from the labor force due to death and retirements at each age level. The tables for women relate withdrawals to marital status and child bearing as well as to death and retirement.

[3] Since replacements due to transfers from one occupation to another are as high as those due to death and retirements in some occupations, the collection and analysis of transfer rates would be ideal. However, at present we must recognize the fact that little data exists on the quantity and nature of occupational shifts. The Department of Labor is presently working on methods that will obtain quantitative data on this type of mobility. There are a few studies on selected occupations and professions at present. One is the Post Censal study of Professional and Technical personnel. A follow up on Professional and Technical personnel indicated that the estimated annual transfer rates for engineers would be in the proximity of 1.6 percent, for technicians, the figure is three percent, etc. Data on occupational shifts

It is hoped that in the future both vocational education files and the employment service applicant files will serve as a proxy to actual inmigration and outmigration of the specific SMSA, etc.

Since approximately two hundred and fifty traines entered the local labor market and a minimum of three hundred additional employees are required to meet present needs, at least fifty of the hard-to-fill openings for a one year period can in part, at least, be attributed to under training. It should be reiterated that a major function of the HTF-OOH method is that of matching the scarcity of labor in a given occupation and the contribution that some form of vocational training can make in eliminating it. It is suggested at this point that approximately fifty additional trainees over and above the anticipated additional trainees entering the market would be required each year simply to prevent an intensified shortage in the following year and years.

Whether or not vocational schools should be expected to eradicate the present and anticipated scarcity within a time span of one or two years as against four or five etc., depends on a number of factors. One of the determinants is whether or not the vocational schools can enlarge present classroom sizes or enrollments without adding new physical facilities.

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(footnote 3 continued from page 6)

for some craft occupations will be found in the Career Patterns of Former Apprentices. (Bulletin T-14), March, 1959, U. S. Department of Labor. There are estimates of total losses to teaching occupations. (Teacher Turnover in the Public Schools, 1957-58, U. S. Office of Education, OE-23002, and Teacher Turnover in Public Elementary and Secondary Schools, 1959-60, Circular 678, U. S. Office of Education, 1962.)

A second factor is whether or not an adequate faculty for any given curriculum presently exists. Third, we should consider the lag time involved from the moment that a request for additional teachers, both full and part time is made and the time it is filled?

A fourth consideration is whether or not teachers can be shifted from one curriculum to another easily, if at all?

Another question is whether it is either feasible or desirable to expect that a particular curriculum could be phased out or teachers shifted into another program within a relatively short period of time?

In many cases it would probably make more sense to remove a shortage over an extended period, perhaps two to four years, three to five years, etc. This might give vocational institutions enough time in which to phase out obsolute training facilities or curriculum and shift into a program required by future needs. Annual vacancy and unfilled opening surveys in local labor markets will permit analysts to update the estimated universe of hard-to-fill openings.

In attempting to match the estimated universe of hard-to-fill openings of approximately one hundred with a relatively trained supply of labor that enter the market each year we concluded that approximately fifty additional trainees would be absorbed into the labor market.

In addition to the fifty additional trainees required to prevent an intensified shortage we might consider the training of an additional number in order to eventually eliminate the present estimated shortage of approximately one hundred.

Next we should match other supply determinants such as wages, working conditions, etc., with the estimated universe of hard-to-fill openings. Compare wage scales for an occupation with other three-digit DOT occupations. Decide whether or not the going wage rate is relatively high or low. Does it help explain the inadequate supply? Evaluate working conditions and physical demands and make judgements as to whether those factors constitute a barrier to recruitment. This sort of analysis would be duplicated for applicant characteristics, placement experience, and entry requirements as well. If any of these determinants, such as low wages explain inadequate supply, the fifty plus figure must be adjusted.

# OCCUPATIONAL EMPLOYMENT INFORMATION FOR THE MILWAUKEE JOB MARKET AREA

Proposed Format For
Occupational Employment
Information Reports

WISCONSIN STATE EMPLOYMENT SERVICE
Project VISION
March 1967

APPENDIX I

STATE OF WISCONSIN
INDUSTRIAL COMMISSION
[illegible] AREA CODE 608

WISCONSIN STATE EMPLOYMENT SERVICE
MAILING ADDRESS: P.O. BOX 160 [illegible]
OFFICES: 4802 SHEBOYGAN [illegible]
MADISON [illegible]

May 1, 1967

Mr. C.L. Grieber, Director
State Board of Vocational Technical
and Adult Education
1 West Wilson Street, Room 720
Madison, Wisconsin 53702

Dear Mr. Grieber:

The report presented in the following pages is submitted to the State Board of Vocational, Technical and Adult Education by the Wisconsin State Employment Service under the legislative mandate of the Vocational Education Act of 1963.

The information contained in the report represents the findings of a recent analysis of occupational employment needs and opportunities in the Milwaukee Job Market Area. The report presents data on forty-seven occupations or occupational clusters and brings together in one package all relevant factors affecting short and long-range supply and demand.

As stipulated by the Vocational Education Act, the information presented in the report is provided to assist educators in determining occupations for which persons are to be trained and in providing vocational guidance and counseling for students.

If you have any questions or comments concerning the report we will be more than happy to discuss them with you.

Sincerely,

Francis J. Walsh
State Director

FJW:TR:jc

APPENDIX I

The State of Wisconsin
STATE BOARD
OF
VOCATIONAL, TECHNICAL AND ADULT EDUCATION
ROOM 720, 1 WEST WILSON STREET
MADISON 53702

C. L. GREIBER
DIRECTOR

July 31, 1967

Mr. Frank J. Walsh, Director
Wisconsin State Employment Service
601 Hill Farms
Madison, Wisconsin

Dear Mr. Walsh:

Our staff has been very enthusiastic regarding the potential contribution of Project VISION Occupational Information procedures to our program planning and development.

This procedure can provide us with periodic guideposts--not only to occupational needs and job opportunities, but various career guidance information supplementary to the Occupational Outlook Handbook. It brings together a variety of essential information for educational purposes available, heretofore, only through special research efforts.

In addition to the broad national picture of manpower needs, we consider it highly necessary to reflect the community and area modifications of those needs.

The Project VISION procedure provides us for the first time with a procedure and the kind of detail uniquely adaptable to educational planning in these areas of concern. On behalf of the Wisconsin Schools of Vocational, Technical and Adult Education, I strongly urge the Wisconsin State Employment Service to continue on a regular operational basis those services initiated under Project VISION as reflected in the sample report for the Milwaukee Job Market Area, March, 1967.

By so doing, a number of equally important but unfulfilled promises of Project VISION will be kept alive.

Sincerely yours,

State Director
Vocational, Technical and Adult Education

C.L.Greiber
lp

# APPENDIX I

(Proposed Format for Occupational Employment Information Reports)

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## GLOSSARY

Shortages--Those job openings in the Milwaukee area which have been hard-to-fill over a period of time.

Intensity of Shortage--An indication of how difficult it is to fill job openings for an occupation. Shown as a percent that hard-to-fill jobs in an occupation are of all available jobs in that occupation in Milwaukee. For example, when at least 50 percent of available jobs in the occupation have been vacant for a month or more despite active search, the shortage should be described as of "high intensity."

Outlook--Prognosis given for each occupation or occupational cluster for the next eight years, to 1975, arrived at by considering local conditions in light of the national picture. A Rapid Increase implies a gain of 25 percent or more in employment nationally, Moderate is a 15 percent to 24 percent increase in employment, and Slow Increase, a 5 percent to 14 percent growth rate. These growth rates are additions to employment in the occupation, do not include replacements due to deaths and retirements, outmigration, or leaving the occupation. These replacements do not add to employment in the occupation but such needs can be very substantial and in many instances even exceed the rate of expansion.

# OCCUPATIONAL SHORTAGES IN MILWAUKEE

Some 100 occupations, grouped into 47 occupations or occupational clusters and divided into six major vocational education curriculum areas, were deemed to be in persistent short supply in the Milwaukee area, according to a survey conducted by the Wisconsin State Employment Service in March 1967.

All of the shortage occupations are scheduled to expand over the next 8 years (to 1975), although by varying rates of growth. The national expansion rate is arrayed agained each of these locally short occupations. While the rate of growth nationally will not coincide precisely with the local expansion rate, growth is expected to be close enough, unless otherwise noted, to warrant long-range planning on this basis.

The Wisconsin State Employment Service will survey the job market on a periodic--and frequent--schedule to constantly assess the state of the job market and to pick up adjustments in the situation as they occur.

The occupations listed below carry with them a spectrum of detail of direct interest to vocational education authorities. Information so detailed includes: (1) estimated numbers of current shortage in the occupation (2) intensity of shortage as reflected by the percent of job openings to total vacancies in an occupation for which workers could not be found for at least a month despite intensive search; and (3) a long-range national forecast to 1975 by rate of growth. A "rapid increase" denotes at least a 25 percent growth through 1975. A "moderate increase" ranges from 15 to 24 percent, and a "slow" rate of growth, from 5 to 14 percent. These percentages refer to employment additions to the occupation; they do not include replacements due to deaths, retirements, outmigration, or leaving the occupation, which in many cases add substantially to the need.

The most significant shortages numerically were among draftsmen, chauffeurs and drivers, salesmen and sales clerks, stenographers and typists, machine tool operators, welders, maintenance repairmen, and registered nurses. Each one of these had consistent shortages of at least 100 workers.

Some occupations were in relatively shorter supply than others, which for training purposes, could be the basis for establishment of a priority list. As a reflection of this "intensity of shortage" in Milwaukee, there were many occupations in which shortages represented a larger proportion of the total vacancies than others. Thus, there were some 17 occupational groups in which the proportion of hard-to-fill jobs was at least two-thirds of all such openings in the community for those occupations. These included salesmen and sales clerks, trained nurses, technical occupations, electricians, crane operators, draftsmen, lens grinders and polishers, coremakers, tool and die makers, machinists and machine tool operators, welders, repairmen, and workers in metal fabricating, sheet metal fabricating, and plastics fabrication.

It was not possible to calculate the exact need on the "intensity of shortage" for a small number of occupations because of insufficient data in either unfilled openings or job vacancy studies. However, communication with employers, unions and associations indicated that a substantial demand did exist for these occupations.

| | CONTINUING SHORTAGE | INTENSITY OF SHORTAGE | EMPLOYMENT FORECAST TO 1975 |
|---|---|---|---|
| Distributive Education | | | |
| Attendant, Service Station | 60 - 100 | 60% | Rapid |
| Salesman & Sales Clerks | 100 Plus | 70% | Moderate |
| Health Occupations | | | |
| Medical Laboratory Technician | 60 - 100 | 90% | Rapid |
| Nurse Aide | 30 - 60 | 20% | Rapid |
| Nurse, Registered | 100 Plus | 90% | Rapid |
| Home Economics Occupations | | | |
| Domestics & Housekeepers | 30 - 60 | 30% | Rapid |
| Office Occupations | | | |
| Bookkeepers and Related | 30 - 60 | 40% | Rapid |
| Mach. Oprs., Billing, Bookkeeping | 60 - 100 | 50% | Rapid |
| Statistical Clerks and Related | Under 30 | 30% | Rapid |
| Filing Occupations | 30 - 60 | 40% | Rapid |
| General Office Clerks | 30 - 60 | 40% | Rapid |
| Correspondence Clerks | Under 30 | 50% | Rapid |
| Shipping Clerk & Receiving Clerk | Under 30 | 40% | Rapid |
| Secretaries | 30 - 60 | 50% | Rapid |
| Receptionist & Information Clerk | Under 30 | 40% | Rapid |
| Typists and Stenographers | 100 Plus | 50% | Rapid |
| Technical Occupations | | | |
| Production Planner | 60 - 100 | 80% | Rapid |
| Electronic Technician | Under 30 | 80% | Rapid |

| | CONTINUING SHORTAGE | INTENSITY OF SHORTAGE | EMPLOYMENT FOR CAST TO 1975 |
|---|---|---|---|
| Trade and Industry | | | |
| Automobile Mechanic | 60 - 100 | 60% | Moderate |
| Brick and Stone Mason | Substantial Demand | | Rapid |
| Carpenter | 30 - 60 | 50% | Slow |
| Chambermaid and Houseman | Under 30 | 50% | Rapid |
| Chauffeur and Truck Driver | 100 Plus | 30% | Rapid |
| Cook | Under 30 | 40% | Rapid |
| Coremaker | 30 - 60 | 70% | Moderate |
| Construction Equipment Operator | Under 30 | 70% | Rapid |
| Draftsman | 100 Plus | 90% | Rapid |
| Electrician | Under 30 | 90% | Slow |
| Guard and Watchman | Under 30 | 60% | Rapid |
| Janitor and Sexton | 30 - 60 | 30% | Rapid |
| Lens Grinder and Polisher | Under 30 | 80% | Moderate |
| Machine Tool Operator | 100 Plus | 70% | Slow |
| Machinist | 60 - 100 | 80% | Moderate |
| Maintenance Mechanic | 100 Plus | 70% | Moderate |
| Assembler, Electrical Equipment | Under 30 | 90% | Rapid |
| Metal Fabricator | Under 30 | 90% | Rapid |
| Molder | Under 30 | 50% | Slow |
| Painter, Construction | Substantial Demand | | Rapid |
| Plastic Fabrication Occupations | Substantial Demand | | Rapid |
| Plumbers | Substantial Demand | | Rapid |
| Pressman, Printing | Substantial Demand | | Slow |
| Sewing-Machine Operator | 60 - 100 | 70% | Moderate |
| Sheet Metal Fabricator | Under 30 | 70% | Rapid |
| Tailor and Tailoress | Substantial Demand | | Moderate |
| Tool and Die Maker | 30 - 60 | 90% | Moderate |
| Upholsterer | Substantial Demand | | Rapid |
| Waiter and Waitress | 60 - 100 | 40% | Rapid |
| Welders | 100 Plus | 70% | Moderate |

## Interpretation of Job Market Data

Some of the components in each of the line-item occupations listed above may seem to be at variance with one another. This is more apparent than real and simply reflects the complexity of the job market.

The easiest-to-interpret type of occupation is the Trained Nurse which has persistent heavy shortages (over 100), a high intensity of shortage

(90 percent of all the job openings in the area were vacant for at least a month), and a rapid increase to 1975 (over 25 percent).

Nurse Aide demonstrates a different job market situation. Needs in the community total over 200 but only about one-fifth (30 - 60 jobs) are hard-to-fill. While the small shortage is persistent, it is obviously not intense in relation to total area demand. Nevertheless, the occupation will expand rapidly and hence is a "safe" candidate for training.

Machine Tool Operators represent a substantial shortage (over 100) and a high demand intensity (70 percent). Due to automation and other factors, this activity is projected for a "slow increase" (5 - 15 percent) to 1975, or a little less than 2 percent annually on the average. Here the situation is that for the short run. because of the boom in durable goods, a heavy unsatisfied demand exists. On a more normal basis to 1975, however, the number of shortages may be reduced. Nevertheless, because employment in the occupation in the area is substantial it is entirely reasonable to project a continuation of training. In its periodic semiannual or annual assessments of the job market, the Wisconsin State Employment Service will watch this occupation carefully and make pertinent and timely recommendations to the Milwaukee Vocational Education authorities.

A final illustration--Service Station Attendant--represents a common and problem aspect of the job market. The "shortage" of attendants is largely attributable to a low wage situation causing high turnover and workers to leave the occupation. In listing this and similar occupations as a shortage situation, it should be clear that it is not the purpose of this listing to perpetuate a low wage structure, nor perhaps by its omission from the list to correct a social situation. The findings simply describe an existing circumstance in the job market. The Employment Service would be remiss, however, if it did not call this situation to the attention of the training authorities.

The examples cited above are illustrative with respect to all occupations. A continuing dialogue is necessary between the Employment Service and the Wisconsin State Board of Vocational, Technical, and Adult Education to interpret the data and for the Employment Service to assist in making curriculum decisions to the extent that they would be affected by the available job market information.

## NOTE TO THE READER

The material presented in the following pages is not part of, nor contemplated by, the Unfilled Opening - Occupational Outlook Handbook technique as proposed by Mr. Medvin. Instead, it is an amplification of this technique which is deemed necessary by Project VISION staff who were involved in preparing this report.

In recommending a report such as is exemplified in the following pages, it is the intent of Project VISION staff to suggest an instrument which not only identifies specific occupational needs and recommendations but also provides data for many other users of job market information such as guidance counselors, students and employers. It is hoped that such a format would present, in summary form, a discussion of all pertinent factors affecting occupational supply and demand.

## DISTRIBUTIVE EDUCATION

| Occupational Titles | Shortage | Intensity | Outlook |
|---|---|---|---|
| Automobile Service-Station Attendant | 60 - 100 | 60% | Rapid |
| Salesman and Sales Clerk | 100 Plus | 70% | Moderate |

## HEALTH OCCUPATIONS

| Occupational Titles | Shortage | Intensity | Outlook |
|---|---|---|---|
| Medical Laboratory Technician | 60 - 100 | 90% | Rapid |
| Nurse Aide | 30 - 60 | 20% | Rapid |
| Nurse, Registered | 100 Plus | 90% | Rapid |

## REGISTERED NURSE

### Employment Outlook

There has been a critical shortage of Registered Nurses in the Milwaukee area for a number of years. For the past several years this shortage has approached 200 nurses annually. Even with the increase in training there will still be a critical need for more nurses through the 1970's brought about in part by the increase in the number of births, the increase in the number of people over 65, and the introduction of Medicare.

This year approximately 430 new R.N.'s will graduate from two colleges, Milwaukee Institute of Technology and six hospital nursing schools in Milwaukee. Although 430 appears to be a large number of new entrants into nursing, many will leave Milwaukee to seek employment outside of the area and still others will be absorbed as replacements for nurses who retire or leave the profession for reasons of health or because of family obligations.

One-third of the 1967 graduating nurses in Milwaukee will receive bachelor's degrees. Both Marquette University and Alverno College have a nursing program leading to a baccalaureate, and by 1969 the University of Wisconsin-Milwaukee Campus will have a similar program. These schools are associated with area hospitals where the students are able to relate theory with practical experience. Nurses with baccalaureate degrees are in greatest demand and have the shortest supply. Few people enter the college program since it is longer and costlier than other nursing programs. However, with a baccalaureate degree nurses receive higher pay, have a better chance for advancement and can obtain a higher degree.

### Education, Training, and Experience

The newest and shortest avenue to become a R.N. is the two year associate degree program at Milwaukee Institute of Technology. Like the diploma program the associate degree program combines the academic study with nursing education and clinical practice. Only 25 of the anticipated 430 nursing graduates of 1967 are under the associate degree program. However, approximately nirty percent of the Wisconsin nurses, according to a survey conducted in 1964, have diplomas. The diploma program requires three years, the first nine months of the program are spent in a college learning theory. The remaining training combines the theory with practice in the hospital.

### Wages and Working Conditions

Starting wages for nurses have increased considerably during the past several years and nurses can now expect a starting wage equivalent to other professionals. The lowest in the Milwaukee area for nurses is in industry. The median wage is $110 per week; however, with the many fringe benefits, better working conditions and hours the real differential in wages is slight. Public hospitals are currently paying staff nurses $519 to $606 a month, in June the wages will increase to $541 - $625, and private hospitals are paying $475 to $600 a month. Unlike nurses working in industry, hospital nurses may have to work evening or night shifts as well as on weekends and holidays.

Worker Traits
Desirable traits for nursing are emotional maturity, understanding and a genuine desire to work and care for the physical needs of other people. They also have to be highly adaptable at times, working under adverse conditions, and able to work independently as well as under supervision. Nurses are employed in hospitals, rest homes, private industry, public health, private duty, doctor's offices and in education.

Recommendation
Over training for nurses is highly unlikely. The outlook nationally for the number of nurses needed by 1975 is expected to increase by 45 percent over the number currently employed. For Milwaukee this means 5,900 nurses will be needed in order to obtain this goal. Graduating classes will have to be increased by 40 percent, and this estimate was made after taking into consideration the fact that the University of Wisconsin-Milwaukee campus will also be graduating nurses starting in 1969.

APPENDIX I

## HOME ECONOMICS

| Occupational Title | Shortage | Intensity | Outlook |
|---|---|---|---|
| Domestic Service Occupations | 30 - 60 | 30% | Rapid |

## OFFICE OCCUPATIONS

| Occupational Titles | Shortage | Intensity | Outlook |
|---|---|---|---|
| Bookkeeper and Related Occupations | 30 - 60 | 40% | Rapid |
| Correspondence Clerk | Under 30 | 50% | Rapid |
| File Clerk | 30 - 60 | 40% | Rapid |
| General Office Clerk | 30 - 60 | 40% | Rapid |
| Machine Operators, Billing, Bookkeeping and Computing | 60 -100 | 50% | Rapid |
| Receptionist and Information Clerk | Under 30 | 40% | Rapid |
| Secretary | 30 - 60 | 50% | Rapid |
| Shipping and Receiving Clerk | Under 30 | 40% | Rapid |
| Statistical Clerk & Related Occupations | Under 30 | 30% | Rapid |
| Stenographer and Typist | 100 Plus | 50% | Rapid |

## TECHNICAL OCCUPATIONS

| Occupational Titles | Shortage | Intensity | Outlook |
|---|---|---|---|
| Electronics Technician | Under 30 | 80% | Rapid |
| Production Planner | 60 -100 | 80% | Rapid |

APPENDIX I

## TRADE AND INDUSTRY

| Occupational Titles | Shortage | Intensity | Outlook |
|---|---|---|---|
| Assembler, Electrical Equipment | Under 30 | 90% | Rapid |
| Automobile Mechanic | 60 - 100 | 60% | Moderate |
| Boilermaker | Substantial Demand | | Moderate |
| Brick and Stone Mason | Substantial Demand | | Rapid |
| Carpenter | 30 - 60 | 50% | Slow |
| Chambermaid and Houseman | Under 30 | 50% | Rapid |
| Chauffeur and Truck Driver | 100 Plus | 30% | Rapid |
| Cook | Under 30 | 40% | Rapid |
| Coremaker | 30 - 60 | 70% | Moderate |
| Crane Operator and Operating Engineer | Under 30 | 70% | Rapid |
| Draftsman | 100 Plus | 90% | Rapid |
| Electrician | Under 30 | 90% | Slow |
| Guard and Watchman | Substantial Demand | | Rapid |
| Janitor and Sexton | 30 - 60 | 30% | Rapid |
| Lens Grinder and Polisher | Under 30 | 80% | Moderate |
| Machine Tool Operator | 100 Plus | 70% | Slow |
| Machinist | 60 - 100 | 80% | Moderate |
| Maintenance Mechanic | 100 Plus | 70% | Moderate |
| Metal Fabricator | Under 30 | 90% | Rapid |
| Molder | Under 30 | 50% | Slow |
| Painter, Construction | Substantial Demand | | Rapid |
| Plastic Fabrication Occupations | Substantial Demand | | Rapid |
| Plumber | Substantial Demand | | Rapid |
| Pressman, Printing | Substantial Demand | | Slow |
| Sewing Machine Operator | 60 - 100 | 70% | Rapid |
| Sheet Metal Fabricator | Under 30 | 70% | Rapid |
| Tailor and Tailoress | Substantial Demand | | Moderate |
| Tool and Die Maker | 30 - 60 | 90% | Moderate |
| Upholsterer | Substantial Demand | | Rapid |
| Welder | 100 Plus | 70% | Moderate |

## AUTOMOBILE MECHANIC

### Nature of the Job

Skilled auto mechanics must be able to service the mechanical parts of motor vehicle regardless of the specific make or model. In some of the larger shops, the trend toward specialization will be significant according to types of repair such as brakes, carburetors, engines, and etc. However, even these shops will need the all-round mechanic for leadmen and supervisors. In working as an auto mechanic, emphasis is placed upon manual skills, and the application of an organized body of knowledge related to the principles of mechanical repairing. The basic replacement and repair work performed by the mechanic is accomplished using a variety of hand tools; also required are certain amounts of bench work involving the operation of power machinery such as drill presses and grinders. Diagnosis of mechanical difficulties with and without the aid of testing equipment is an important aspect of this job. The mechanic is also expected to be conversant with new developments in transportation equipment, and the techniques utilized in repairing equipment malfunctions. Auto mechanics are often required to work in cramped positions and in close proximity to grease and dirt. Potential hazards do exist with respect to the proximity of noxious and flamable compounds to the work area.

### Employment Outlook

The tremendous number of motor vehicles purchased each year seems to assure a continuing demand for all-round mechanics. In 1960, the number of mechanics employed in the Milwaukee SMSA totalled 4,300. It is anticipated that by 1975 the number will increase by approximately 17%.

### Education, Training, and Experience

Entry into employment as an auto mechanic can be accomplished through a number of training avenues. Such avenues include formal apprenticeship training usually three to four years in duration with approximately ten weeks spent in vocational schools, one and two year vocational and technical school programs, specialized training programs such as MDTA and MDTA-OJT, and various informal on-the-job training program. All of these training methods appear to offer rather reliable training and good prospects of being employed once training is complete. However, persons should try to rely on formal or recognized training programs whenever possible.

The Milwaukee SMSA offers several training opportunities for entry into employment as an auto mechanic. The Milwaukee Auto Trades Council is training both the auto mechanic and auto body repairman in a two year program. Another, MDTA-OJT contract of more specialized nature has recently been established by the Wisconsin

Motor Carrier Association. This program involves training in truck and body building with $2.55 per hour as an entry wage for trainees.

In 1966 a total of 144 students graduated from high school auto repair courses. Educators in Milwaukee are expanding this program with two new high schools to offer courses in auto repairs. A small initial enrollment is expected. They stated that they are encouraged by the fact that students taking these courses have a low drop out rate, less than 10%. As a result, further expansion of existing courses is expected. On the post-high level, at the Milwaukee Institute of Technology, 276 students are enrolled in auto maintenance courses. A total of 22 will graduate in June 1967. In addition to these courses there is a 17 week course offered by the General Motors Institute in which 43 are enrolled.

## Wages and Working Conditions

Wages for these positions vary over a broad range depending on type of training, length of time on the job, degree of skill required, etc. However, according to the Bureau of Labor Statistics the median wage for auto mechanic is $3.51 per hour in the Milwaukee SMSA. At present 40% of all mechanics are employed in independent repair shops, and another 25% are employed by truck and auto dealers. Other major employers of auto mechanics will continue to be gasoline service stations, motor vehicle manufacturers and operators of large fleets of trucks and buses.

## Worker Traits and Related Occupations

Significant aptitudes relating to the tasks performed by the auto mechanics are:

Spatial - Ability to comprehend forms in space and understand relationships of plane and solid objects. This ability is important in understanding the functioning of various mechanical parts of motor vehicles.

Form Perception - Ability to perceive pertinent detail in objects. Particularly important is recognizing various mechanical parts and their function.

Motor Coordination & Manual Dexterity - It is extremely important to be able to move hands and fingers skillfully and accurately in manipulation of hand tools to repair motor vehicles.

Trained auto mechanics have a wide variety of related jobs open to them. Listed below are titles of those occupations related to auto mechanic.

Automobile Mechanic
Automobile Service Mechanic

Brakeman, Automobile
Automobile Radiator Man

Automobile Tester
Tractor Mechanic
Bus Mechanic
Engineering Equipment Mechanic
Motorboat Mechanic
Motorcycle Mechanic
Truck Mechanic
Carburetor Man
Front-End Man
Transmission Mechanic
Tune-Up Man
Electrician, Automotive
Muffler Installer
Clutch Rebuilder

Recommendation

Considering the anticipated mild growth rate in the demand for auto mechanics, the expected replacement need, and the present moderate estimated universe of hard-to-fill openings, we recommend at least thirty-five, possibly forty-five additional students be trained per year for the next three years. This would be over and above the present anticipated increase in trainees.

The above recommendation is a consequence of our evaluation of the interaction between the estimated universe of hard-to-fill openings and all the supply determinants.

## DRAFTSMAN

### Nature of the Job

Work performed by draftsmen involves primarily the translation of ideas, rough sketches, specifications and calculations of engineers, architects and designers into complete and accurate work plans for use in construction and manufacturing processes. Equipment frequently utilized by draftsmen to produce drawings consists of triangles, scales, dividers, compasses, T-square and french curves. Many employers require draftsmen to furnish their own tools.

### Employment Outlook

A tremendous demand exists for draftsmen in the Milwaukee area, and it is not likely that this demand will subside in the near future. In fact, the National Outlook is for a rapid increase (25.0% or more) in the number of draftsmen needed through 1975. Other sources indicate that the increase could possibly be as large as 40%.

Currently there are 4,200 draftsmen employed in the Milwaukee area. The majority of these draftsmen are employed in the machinery, electrical equipment, fabricated metal products and transportation equipment industires. Due to the heavy concentration of these industries in the Milwaukee area and the anticipated growth that these industries should experience as stated in America's Industrial and Occupational Manpower Requirements 1964 - 75, it would seem to indicate that these industries would create a substantial demand for draftsmen through 1975.

Recent findings indicate that over the last year there was an average of over 100 hard-to-fill openings for draftsmen in the Milwaukee area. Further study showed that 87% of the openings on file at the WSES District Office went unfilled for 30 days or more. In addition, it should be pointed out that many of these positions could have been filled by trainees without extensive drafting experience, due to the extreme shortage.

### Education, Training and Experience

Graduation from vocational or technical high school is usually the minimum educational requirement for entry into this field. An apprenticeship program of three years does exist and is very favorable method of entry into this field. Many employers require either apprenticeship training or additional training such as that offered by a vocational school or similar institution. This type of training, beyond high school, is a must for those persons wishing to proceed to a higher technical level. Courses usually include mathematics, physical sciences, mechanical drawing, standard methods of lettering and tracing.

There are a number of training opportunities in the Milwaukee area open to persons interested in entering drafting occupations. Two vocational schools offer a two year associate degree program in Mechanical Technology which prepares the student for drafting as well as other technical work. Approximately 100 students complete this course each year, but some enter positions other than drafting occupations. As a result, less than 100 students go into drafting or enter the Milwaukee labor market at this level. Additional training opportunities are available as part-time or evening courses at vocational schools in which approximately 485 are enrolled. Not all of this number will graduate from the one and one-half year program. Students enroll for one or two semesters and receive the rest of their training on-the-job. Financial aid is often supplied by employers for these courses. This training (part-time and evening) prepares the student for the entry level positions. Continued schooling and experience will result in the ability to do more complex work.

There are 100 persons currently enrolled in the apprenticeship program. They are required to attend vocational school each week for four hours for a minimum of 400 hours during their apprenticeship with employers required to bear the cost of the courses and the wages of the apprentice.

In addition to these training programs students at Boy's Tech must take five semesters of drafting. Enrollments currently total 100 in the mechanical drafting course, with 20 graduates anticipated in June 1967. These students, according to school authorities, will probably enter drafting occupations.

## Wages and Working Conditions

Wages for draftsmen range from an average weekly wage of $80 for tracers to $150.50 per week for Class A draftsmen. In addition, employers frequently pay tuition for employees attending advanced courses in drafting and related subjects. Working conditions present no real problems since drafting rooms are well-lighted, ventilated, and clean. Hazards are non-existant and physical exertion is at a minimum.

## Worker Traits and Related Occupations

Significant aptitudes relating to drafting occupations are:

Numerical - Draftsmen must be able to work with numbers quickly and easily involving dimensions of objects and conversion of actual dimensions to scale.

Spatial - Ability to comprehend forms in space and to understand relationships of plane and solid objects for conversion to drawings.

Form perception - Ability to perceive pertinent detail in translating sketches to working drawings.

There is a good selection of positions open to persons having completed advanced training in this field. Listed below are some of the related job titles.

Draftsman Designer
Architectural Draftsman
Detailer-Draftsman
Bank-Note Designer
Electrical Draftsman
Engineering Aide
Mechanical Draftsman
Structural Draftsman
Tool-&-Die Draftsman
Topographical Draftsman

Many of the more specialized positions listed require only the standard educational preparation, because specialization occurs through on-the-job training.

Recommendation

Our basic recommendation is as follows: In order to eliminate the excessive demand over supply for draftsmen within a period of four to five years, a 35% increase in graduates would be called for. Given an estimate of from 135 to 145 graduates for the school year 1966-1967, a 35% increase would necessitate an additional increase of 50 for the school year 1967 - 1968.

In addressing ourselves to the annual average increase in demand for draftsmen and replacement needs we find that an additional increase of 50 - 70 trainees over those presently graduating would be absorbed within the Milwaukee area alone. Therefore, at least one hundred additional graduates would be gainfully employed in 1968 alone.

Our final estimate of one hundred to one hundred twenty was based on the assumption that the average estimated growth in demand for draftsmen per year is 1.8%. This estimate is three-fourths of the 2.5% or more figure projected in the Occupational Outlook or one-half of the annual 3.6% prognosis found in America's Industrial and Occupational Manpower Requirements 1964-75. The higher growth rate is predicted on the assumption that the unemployment rate approximates 3%. This rate does, in fact, depict the actual unemployment rate in the Milwaukee SMSA in the first two months of 1967 and exceeds the two percent average that existed in the last quarter of 1966.

# APPENDIX J

## CONVERSION OF HEW INSTRUCTIONAL PROGRAM TITLES AND CODES INTO VOCATIONAL COURSE TITLES AND CODES FROM MILWAUKEE TECHNICAL COLLEGE

Page

INTRODUCTION J- 2

TABLES:

I. Conversion of HEW Instructional Programs to Milwaukee Technical College Courses J- 5

II. Conversion of Milwaukee Technical College Courses (from Adult-Vocational, Apprentice, and Adult High School Divisions Handbook) to HEW Instructional Programs J-12

III. Conversion of Milwaukee Technical College Courses (from Technical and Junior College Divisions Handbook) to HEW Instructional Programs J-21

IV. Conversion of Milwaukee Technical College Subject Matter Areas, Not Related to Apprenticeship, Diploma, or Certificate Programs, to HEW Instructional Programs J-25

# APPENDIX J.

## OCCUPATIONAL CLUSTER REFERENCE GUIDE

### INTRODUCTION

The Occupational Cluster Reference Guide converts HEW curriculum codes into DOT codes and titles. The following quotation from the Introduction to the Guide describes the philosophy underlying its development:

> A major difficulty of previous years in establishing a dialogue between the Employment Service and Vocational Education authorities has been the lack of a common occupational nomenclature. Having recognized the need for a system that would facilitate the translation of the various occupational competencies to corresponding educational curricula, the U.S.E.S., the Office of Education and the W.S.E.S. jointly prepared such an instrument. The following paragraphs will provide a short discussion of the various aspects of the system and hopefully demonstrate the significance of such clusters in terms of data interpretation and presentation.
>
> The basic principle behind the development of this clustering system was the clustering of occupations dealing in similar bodies of knowledge and/or occupations having a common core of skills. Such a body of knowledge consists of abilities and technical capacity that enables a person to function effectively in a given occupation. The D.O.T. definitions lend themselves to such a classification system because the definitions and coding structure have been developed to reflect this type of information. This does not necessarily mean that every D.O.T. title was classified according to an appropriate curriculum because many titles and definitions are intended to describe specialized techniques found only in a small number of establishments. However, those D.O.T. titles that were used were selected on the basis of offering the broadest definition and application of a given occupation. Also, those occupations requiring no significant formal training have not been listed under any instructional program. And yet, persons using this material should have little difficulty identifying specific curriculum descriptions for any occupational title.
>
> The manual contains seven of seventeen curriculum subject matter areas. These areas were selected because they are identified as occupational areas of particular significance for vocational education institutions. These seven areas are:

| | |
|---|---|
| 1. Agricultural Occupations | (01) |
| 2. Distributive Education | (04) |
| 3. Health Occupations | (07) |
| 4. Home Economics | (09) |
| 5. Office Occupations | (14) |
| 6. Technical Education | (16) |
| 7. Trades or Industrial Occupations | (17) |

# APPENDIX J

Each area can be identified by the first two digits of the curriculum code. The curriculum areas are arranged in outline form graduating from broad generality to increased specificity in terms of job knowledge and specialization within a field. The D.O.T. titles were associated with the appropriate curriculum cluster on the basis of similarity of job knowledge required.

Each page contains descriptions of a number of curriculum areas with associated occupational titles and codes. Primarily, this material is to be used as a method of presenting data to vocational schools. The intent of this method of presentation is to clarify occupational information and eliminate the misconceptions that have limited the usefulness of such data in previous years.

The following pages illustrate a technique for converting HEW curriculum codes into vocational school courses and codes. The illustration is based on course information found in the curriculum handbooks used by Milwaukee Technical College. The four conversion tables are arranged as follows:

TABLE I -- HEW instructional program titles and codes, listed in numerical order and converted into appropriate courses of various departments of the Milwaukee Technical College.

TABLE II -- Course titles and codes from the Adult-Vocational, Apprentice, and Adult High School Divisions Handbook of the Milwaukee Technical College, listed in numerical order and converted into appropriate HEW titles and codes.

TABLE III - Course titles and codes from Technical and Junior College Divisions Handbook of the Milwaukee Technical College, listed in numerical order and converted into appropriate HEW titles and codes.

TABLE IV -- Course titles and codes of Milwaukee Technical College subject matter areas not related to apprenticeship, diploma or certificate programs, also arranged in numerical order and converted into appropriate HEW instructional programs.

The application of this technique, in combination with use of the Occupational Cluster Reference Guide described in Chapter XIIIwill enable vocational schools to convert occupational information directly to their own school courses.

TABLE I.

## HEW INSTRUCTIONAL PROGRAMS[1] AS COMPARED TO MILWAUKEE TECHNICAL COLLEGE COURSES

| HEW INSTRUCTIONAL PROGRAM | | MILWAUKEE DEPARTMENTS | | | |
|---|---|---|---|---|---|
| CODE | TITLE | COURSE NUMBER | COURSE TITLE | MANUAL[2] | PAGES NUMBER |
| 01 | AGRICULTURE OCCUPATIONS | - | - | - | - |
| 04 | DISTRIBUTIVE EDUCATION | | | | |
| 04.01 | Distributive Education Instructional Program | (1)1-02:1 | Business Administration | T | 32 |
| | | (1)1-02:2 | General Business | T | 35 |
| 04.01.04 | Finance and Credit | (1)1-02:3 | Finance | T | 32 |
| | | (3)1-05:1 | Financial Clerk | V | 46 |
| 04.01.13 | Management (General) | (1)1-02:4 | Management | T | 33 |
| 04.01.14 | Marketing (General) | (1)1-04:1 | Marketing | T | 44 |
| | | (1)1-04:2 | Marketing Administration | T | 44 |
| 04.01.16 | Real Estate | (1)1-02:5 | Real Estate | T | 34 |
| 04.01.17 | Retail Trade (General) | (1)1-04:3 | Retail Administration | T | 44 |
| | | (3)1-04:1 | Retail Store Training | V | 41 |
| 04.01.99 | Service Marketing - Under other Instructional Programs | (3)1-04:3 | Service Marketing | V | 41 |
| 04.06 | Operations | | | | |
| 04.06.03 | Transportation | (1)1-04:4 | Transportation and Traffic Management | T | 45 |
| 04.10 | Allied Subject Matter | | | | |
| 04.10.99 | No Classified Program Listed Under "Other Allied Subject Matter" | (1)7-01:1 | Telecasting | T | 183 |
| 07 | HEALTH OCCUPATIONS | | | | |
| 07.01 | Dental Service | | | | |
| 07.01.01 | Dental Assistant | (1)5-08:1 | Dental Assistant | T | 97 |
| 07.01.03 | Dental Laboratory Technician | (1)5-08:2 | Dental Laboratory Technician | T | 100 |
| 07.02 | Medical Services | (1)5-09:1 | Medical Assistant | T | 104 |
| 07.02.04 | Nurse | (1)5-10:2 | Professional Nursing (Affiliated Hospital Schools) | T | 109 |
| | | (1)5-10:3 | Professional Nursing (Associate Degree) | T | 108 |
| 07.02.05 | Nurse's Aide | (3)5-10 | Nursing (no formal program) | V | 289 |

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[1] Only when there is a relationship are the HEW Instructional Programs listed.

[2] T - Technical and Junior College Division manual. V - Adult-Vocational, Apprentice and Adult High School Div. manual.

[3] The page numbers refer to T - (1967-69 Edition) and V - (1968-70 Edition)

| HEW INSTRUCTIONAL PROGRAM | | MILWAUKEE DEPARTMENTS | | | |
|---|---|---|---|---|---|
| CODE | TITLE | COURSE NUMBER | COURSE TITLE | MANUAL | PAGES NUMBER |
| 07.02.06 | Practical (Vocational Nurse) | (1)5-10:1 | Practical Nursing | T | 107 |
| 09 | HOME ECONOMICS | | | | |
| 09.02 | Home Economics - Occupational Preparation | | | | |
| 09.02.01 | Care & Guidance of Children | (3)3-05:2 | Child Day Care Assistant Training | V | 97 |
| 09.02.04 | Home Furnishings, Equipment & Service | (3)3-04:2 | Drapery Consultant Specialist | V | 103 |
| 09.02.05 | Institutional and Home Management and Supporting Services | (3)3-04:1 | Home Management Aide | V | 103 |
| 14 | OFFICE OCCUPATIONS | | | | |
| 14.01 | Accounting and Computing Occupations | | | | |
| 14.01.01 | Accountant, Junior | (1)1-01:1 | Accounting | T | 28 |
| 14.01.02 | Bookkeepers | (3)1-01:1 | Accounting | V | 28 |
| 14.01.03 | Cashiers | (3)1-04:2 | Cashier-Checker Training | V | 41 |
| 14.01.04 | Machine; Billing, Bookkeeping and Computing Machine Operators | (3)1-03:1 | Business Machines | V | 35 |
| 14.01.04(99) | (Specialization-notcoded-Bookkeeping Machines) | (3)1-03:2 | Bookkeeping Machines | V | 35 |
| 14.01.04(99) | (Specialization-not coded-Calculating Machines) | (3)1-03:3 | Calculating Machines | V | 35 |
| 14.02 | Business Data Processing Systems Occupations | | | | |
| 14.02.01 | Computer and Console Operators | (3)1-07:3 | Business Data Processing | V | 31 |
| 14.02.03 | Programmers | (1)1-07:1 | Business Data Processing | T | 41 |
| 14.03 | Filing, Office Machine, & General Office Clerical Occupations | | | | |
| 14.03.01 | Duplicating Machine Operators | (3)1-03:4 | Duplicating Machines | V | 36 |
| 14.03.03 | General Office Clerks | (3)1-06:2 | Office Clerical | V | 52 |
| 14.04 | Information Communications Occupations | | | | |
| 14.04.06 | Receptionists and Information Clerks | (3)1-05:2 | Receptionist | V | 46 |
| 14.07 | Stenographic, Secretarial and Related Occupations | | | | |
| 14.07.02 | Secretaries | (1)1-06:1 | Secretarial Science | T | 51 |
| | | (1)1-06:2 | Secretarial | T | 51 |
| | | (3)1-06:1 | Secretarial | V | 51 |
| 14.07.02(99) | Legal Secretarial (not specifically coded) | (1)1-06:3 | Legal Secretarial | T | 51 |
| 14.07.03 | Stenographers | (3)1-06:3 | Stenographer Clerical | V | 52 |

| HEW INSTRUCTIONAL PROGRAM | | MILWAUKEE DEPARTMENTS | | | |
|---|---|---|---|---|---|
| CODE | TITLE | COURSE NUMBER | COURSE TITLE | MANUAL | PAGES NUMBER |
| 14.09 | Typing and Related Occupations | | | | |
| 14.09.01 | Clerk-Typist | (3)1-03:5 | Transcribing Machines | V | 36 |
| 14.09.02 | Key Punch and Coding Equipment Operators | (3)2-04:6 | Teletype Setter Perforator Operator | V | 72 |
| 16 | TECHNICAL EDUCATION | | | | |
| 16.01 | Engineering Related Technology | (1)6-08:1 | Technical Engineering | T | 167 |
| 16.01.03 | Architectural Engineering Technology | (1)6-14:1 | Architectural Technology | T | 124 |
| 16.01.04 | Automotive Engineering Technology | (1)6-02:1 | Automotive Technology | T | 127 |
| | (The above two are not exactly comparable. The H.E.W. course is primarily oriented to production Engineering; the M.T.C. to maintenance at technician level) | | | | |
| 16.01.05 | Chemical Engineering Technology | (1)6-03:1 | Chemical Technology | T | 30 |
| 16.01.06 | Civil Engineering Technology | | | | |
| 16.01.06.01 | Roadway Technology | (1)6-15:2 | Highway | T | 133 |
| 16.01.06.03 | Structural Technology | (1)6-15:1 | Structural | T | 132 |
| 16.01.07 | Electrical Engineering Technology | (1)6-05:1 | Electrical Technology | T | 142 |
| | | (1)6-08:2 | Technical Engineering, Electrical Major | T | 168 |
| 16.01.08 | Electronics Engineering Technology | (1)6-05:3 | Electrical Technology, Electronics Major | T | 143 |
| 16.01.08.99 | Not coded program - communications technology under electronics | (1)6-05:2 | Electrical Technology, Communications Major | T | 143 |
| 16.01.10 | Environmental Control Engineering Technology | (1)6-01:1 | Air Conditioning and Refrigeration Technology | T | 121 |
| 16.01.11 | Industrial Engineering | (1)6-08:3 | Technical Engineering Industrial Major | T | 169 |
| 16.01.13 | Mechanical Engineering Technology | (1)6-06:1 | Mechanical Technology | T | 155 |
| | | (1)6-08:4 | Technical Engineering Mechanical Major | T | 168 |
| 16.01.13.01 | Energy Conversion | (1)6-04:1 | Diesel Technology | T | 138 |
| 16.01.13.02 | Machine and Tool Design | (1)6-06:2 | Mechanical Technology, Design Major | T | 155 |
| | | (1)6-08:5 | Technical Engineering Tooling Major | T | 170 |
| 16.01.13.03 | Production | (1)6-03:3 | Mechanical Technology Manufacturing Major | T | 155 |
| 16.01.13.99 | No classified program-fluid power technology under mechanical technology | (1)6-12:1 | Fluid Power Technology | T | 152 |
| 16.01.14 | Metallurgical Engineering Technology | (1)6-13:1 | Metallurgical Technology | T | 162 |
| 16.01.17 | Scientific Data Processing | (1)6-05:5 | Electrical Technology Computers Major | T | 144 |
| 16.01.99 | No coded and classified HEW program - combines various programs under other engineering related Tech. | (1)6-16:1 | Photo Instrumentation Technology | T | 165 |
| 17 | TRADES AND INDUSTRIAL OCCUPATIONS | | | | |
| 17.01 | Air Conditioning | (3)4-01:1 | Air Conditioning, Refrigeration and Heating | V | 116 |
| 17.02 | Appliance Repair | (3)4-45:1 | Appliance Servicing | V | 126 |

| HEW INSTRUCTIONAL PROGRAM | | MILWAUKEE DEPARTMENTS | | | |
|---|---|---|---|---|---|
| CODE | TITLE | COURSE NUMBER | COURSE TITLE | MANUAL | PAGES NUMBER |
| 17.03 | Automotive Industries | (3)4-04:1 | Automobile Servicing | V | 130 |
| 17.03.01 | Body and Fender | (3)4-04:2 | Body and Fender | V | 131 |
| | | (3)4-04:9 | Body and Fender | V | 131 |
| | | (5)4-04:2 | Automobile Body Repairman | V | 132 |
| 17.03.02 | Mechanics | (3)4-04:8 | Automobile Servicing Mechanical-Electrical | V | 131 |
| | | (5)4-04:1 | Automobile Mechanic | V | 131 |
| 17.03.03 | Specializations (Not broken into codes) | (3)4-04:1 | Automobile Servicing: | V | 130 |
| | | Not Coded | Automobile Electrical Systems | V | 130 |
| | | Not Coded | Automobile Engines | V | 130 |
| | | Not Coded | Automobile Front end and Brakes | V | 130 |
| | | Not Coded | Automobile Transmission and Drivelines | V | 131 |
| 17.04 | Aviation Occupations | | | | |
| 17.04.01 | Aircraft Maintenance | | | | |
| 17.04.01.01 | Air Frame | (3)4-02:2 | Air Frame Mechanic | V | 119 |
| 17.04.01.02 | Power Plant and Auxillary Systems | (3)4-02:3 | Power Plant Mechanic | V | 119 |
| 17.05 | Blueprint Reading | No Occupational Relationships | | | |
| 17.07 | Commercial Art | (1)2-01:1 | Commercial Art | T | 62 |
| 17.09 | Commercial Photography | (1)2-03:1 | Commercial Photography | T | 66 |
| 17.09.99 | Photographic Laboratory and Dark Room Occupations | (3)2-03:1 | Photography: Dark Room Aide | V | 67 |
| 17.10 | Construction and Maintenance Trades | | | | |
| 17.10.01 | Carpentry | (3)4-10:1 | Carpentry | V | 152 |
| | | (3)4-10:2 | Carpentry | V | 152 |
| | | (5)4-10:1 | Carpentry | V | 153 |
| 17.10.02 | Electricity | (5)4-13:1 | Electricity - Apprentice | V | 164 |
| 17.10.04 | Masonry | (3)4-08:1 | Bricklayer and Masonry | V | 143 |
| | | (3)4-08:2 | Bricklayer and Masonry | V | 144 |
| | | (5)4-08:1 | Bricklayer and Mason | V | 144 |
| 17.10.05 | Painting and Decorating | (5)4-24:1 | Painting and Decorating | V | 205 |
| 17.10.07 | Plumbing and Pipe Fitting | (5)4-27:1 | Plumber | V | 211 |
| Not Coded | Sprinkler Fitting | (5)4-34:1 | Sprinkler Fitting | V | 230 |
| Not Coded | Steam Fitting | (5)4-35:1 | Steamfitter | V | 232 |
| 17.10.99 | Other Construction and Maintenance Trades | | | | |
| Not Coded | Cement Mason | (5)4-08:2 | Cement Mason | V | 144 |
| Not Coded | Carpet and Resilient Tile Layer | (5)4-11:1 | Carpet and Resilient Tile Layer | V | 158 |
| Not Coded | Glazier | (5)4-17:1 | Glazing | V | 181 |
| Not Coded | Sheet Metal Worker | (5)4-32:1 | Sheet Metal Worker | V | 219 |
| Not Coded | Structural Steel and Iron Work | (5)4-37:1 | Structural Steel and Iron Work | V | 235 |

APPENDIX J

| HEW INSTRUCTIONAL PROGRAM | | MILWAUKEE DEPARTMENTS | | | |
|---|---|---|---|---|---|
| CODE | TITLE | COURSE NUMBER | COURSE TITLE | MANUAL | PAGES NUMBER |
| 17.12 | Diesel Mechanic | (3)4-12:1 | Combustion Enines | V | 160 |
| | (The above is not a perfect match - H.E.W. has no provision for combined diesel and gasoline large combustion engine mechanic except for some specific applications such as 17.10.03.01 maintneance, heavy construction equipment and some occupations under 17.03.02 automotive mechanic) | | | | |
| 17.13 | Drafting Occupations | (5)4-21:1 | Mechanical Drafting (all types drafting) | V | 197 |
| Not Coded | Mechanical Drafting | (3)4-21:1 | Mechanical Drafting | V | 198 |
| Not Coded | Architectural Drafting | (3)4-03 | Architectural Drafting (no formal program) | V | 128 |
| 17.14 | Electrical Occupations | | | | |
| 17.14.01 | Industrial Electrician | (3)4-13:1 | Electricity (Diploma Program) | V | 163 |
| 17.15 | Electronics Occupations | (3)4-14:1 | Electronics, Radio and Television | V | 170 |
| 17.17 | Foremanship, management and supervision development | (3)1-08 | Management Development (no specific occupational relationships) | V | 39 |
| 17.19* | Graphic Arts Occupations | | | | |
| Not Coded | Technical and Managerial Occupations | (1)2-04:1 | Printing and Publishing | T | 72 |
| Not Coded | Technical Occupations | (1)2-04:2 | Printing and Publishing Operations Major | T | 72 |
| Not Coded | Managerial Occupations | (1)2-04:3 | Printing and Publishing Administration Major | T | 72 |
| Not Coded | Trades and Industry Occupations | | | | |
| Not Coded | Composition and Make Up Occupations | (3)2-04:2 | Composition and Make up | V | 72 |
| | | (5)2-04:1 | Compositor Apprenticeship | V | 73 |
| Not Coded | Machine Type Setting Occupations | (3)2-04:3 | Machine Typesetting | V | 72 |
| Not Coded | Press Work Occupations | (3)2-04:4 | Presswork | V | 72 |
| Not Coded | Lithographic, Photographic and Plate Making Occupations | (5)2-04 | Lithographic Offset Apprentice Program | V | 73 |
| Not Coded | Lithographic Proofer | (5)2-04:3 | Lithographic Proofer | V | 73 |
| Not Coded | Lithographic Cameraman | (5)2-04:4 | Lithographic Cameraman | V | 74 |
| Not Coded | Lithographic Stripper | (5)2-04:5 | Lithographic Stripper | V | 75 |
| Not Coded | Lithographic Platemaker | (5)2-04:6 | Lithographic Platemaker | V | 76 |
| Not Coded | Lithographic Artist | (5)2-04:7 | Lithographic Artist | V | 77 |
| Not Coded | Lithographic Offset Pressman | (5)2-04:8 | Lithographic Offset Pressman | V | 78 |

*Suggested codes have been submitted

| HEW INSTRUCTIONAL PROGRAM | | MILWAUKEE DEPARTMENTS | | | |
|---|---|---|---|---|---|
| CODE | TITLE | COURSE NUMBER | COURSE TITLE | MANUAL | PAGI NUMBI |
| 17.21 | Instrument Maintenance and Repair Occupations | | | | |
| 17.21.02 | Watchmaking and Repair | (3)4-41:1 | Watch and Allied Instrument Repair | V | 251 |
| | | (5)4-41:1 | Watch and Allied Instrument Repair | V | 252 |
| 17.23 | Metal Working Occupations | | | | |
| 17.23.01 | Foundry and Related Occupations | (5)4-15:1 | Foundry (Apprenticeship) | V | 177 |
| Not Coded | Machine Molding and Coremaking Occupations | (3)4-15:3 | Machine Molding & Coremaking | V | 177 |
| Not Coded | Loose Pattern Molding Occupations (Bench, Floor and Pit Molders) | (3)4-15:4 | Loose Molder | V | 177 |
| 17.23.02 | Machine Shop | (3)4-20:1 | Machine Shop | V | 186 |
| | | (5)4-20:1 | Machine Shop | V | 188 |
| Not Coded | Pattern Making Occupations | (3)4-39:1 | Tool and Die Making | V | 243 |
| | Tool, Die, and Metal | | | | |
| | | (5)4-39:1 | Tool and Die Making | V | 244 |
| 17.23.03 | Machine Tool Operation | | | | |
| Not Coded | Engine Lathe Occupations | (3)4-20:2 | Engine Lathe Operation | V | 187 |
| Not Coded | Milling Machine Occupations | (3)4-20:3 | Milling Machine Operation | V | 187 |
| Not Coded | Turret Lathe Occupations | (3)4-20:4 | Turret Lathe Operation | V | 187 |
| Not Coded | Automatic Screw Machine Occupations | (3)4-20:5 | Automatic Screw Machine Operation | V | 187 |
| 17.23.05 | Sheet Metal | (3)4-32:1 | Sheet Metal | V | 219 |
| | | (3)4-32:2 | Sheet Metal | V | 219 |
| 17.23.06 | Welding | (5)4-42:1 | Welder (Apprentice Program | V | 256 |
| Not Coded | Combination Welding Occupations | (3)4-42:6 | Welding, Gas - Arc | V | 255 |
| Not Coded | Gas Welding Occupations | (3)4-42:7 | Welding, Gas | V | 255 |
| Not Coded | Arc Welding Occupations | (3)4-42:8 | Welding, Arc | V | 256 |
| 17.23.99 | Other Metal Working Occupations | | | | |
| Not Coded | Heat Treating Occupations | (3)4-22:1 | Metallurgy (certificate Program | V | 202 |
| 17.24 | Metallurgy Occupations | (5)4-22:1 | Metallurgy (Apprentice) | V | 202 |
| 17.26 | Personal Services | | | | |
| 17.26.01 | Barbering | (5)5-01:1 | Barbering | V | 256 |
| | | (3)5-01:1 | Barbering | V | 257 |
| | | (5)5-01:2 | Barbering | V | 257 |
| 17.26.02 | Cosmetology | (3)5-02:1 | Cosmetology | V | 278 |
| | | (5)5-02:1 | Cosmetology | V | 278 |
| 17.28 | Public Service Occupations | | | | |
| 17.28.01 | Fireman Training | (1)5-03:1 | Fire Technology | T | 80 |
| 17.28.02 | Law Enforcement Training | (1)5-04:1 | Police Science Technology | T | 83 |

| HEW INSTRUCTIONAL PROGRAM | | MILWAUKEE DEPARTMENTS | | | |
|---|---|---|---|---|---|
| CODE | TITLE | COURSE NUMBER | COURSE TITLE | MANUAL | PAGES NUMBER |
| 17.29 | QUANTITY FOOD OCCUPATIONS | | | | |
| 17.29.01 | BAKER | (1)5-11:3 | PASTRY CHEF | T | 88 |
| | | (3)4-05:1 | BAKER | V | 140 |
| | | (5)4-05:1 | BAKER (APPRENTICE) | V | 140 |
| 17.29.02 | COOK/CHEF | (1)5-11:2 | COMMERCIAL FOOD PREPARATION | T | 87 |
| NOT CODED | SHORT ORDER COOKS | (3)5-18:1 | SHORT ORDER COOK | V | 284 |
| NOT CODED | COUNTERMEN | (3)5-18:3 | COUNTERMAN | V | 285 |
| 17.31 | SMALL ENGINE REPAIR | (3)4-04A | SMALL ENGINE AND OUTBOARD MOTOR REPAIR | V | 131 |
| 17.32 | STATIONARY ENERGY SOURCES OCCUPATIONS | (3)4-28 | POWER PLANT ENGINEERING (NO FORMAL DIPLOMA PROGRAM) | V | 215 |
| 17.33 | TEXTILE PRODUCTION AND FABRICATION | | | | |
| 17.33.01 | DRESSMAKING | (3)4-38:3 | ALTERATION WOMAN | V | 239 |
| 17.33.01 | TAILORING | (3)4-38:1 | TAILORING | V | 238 |
| | | (3)4-38:2 | BUSHELMAN | V | 238 |
| 17.33.99 | OTHER TEXTILE PRODUCTION AND FABRICATION | | | | |
| 17.33.99.02.02 | POWER SEWING OCCUPATIONS (SUGGESTED CODE) | (3)4-29 | POWER SEWING (NO DIPLOMA OR CERTIFICATE PROGRAM) | V | 217 |
| 17.34 | SHOE MANUFACTURING AND REPAIR | (3)4-33:1 | SHOE SERVICING | V | 227 |
| | | 4-33:2 | SHOE SERVICING | V | 227 |
| 17.35 | UPHOLSTERING | (3)4-40:1 | UPHOLSTERING | V | 248 |
| | | (3)4-40:2 | UPHOLSTERING | V | 249 |
| 17.36 | WOODWORKING OCCUPATIONS | | | | |
| 17.36.01 | MILLWORK AND CABINETMAKING | (3)4-09:1 | CABINETMAKING AND MILLWORK | V | 149 |
| | | (3)4-09:2 | CABINETMAKING AND MILLWORK | V | 150 |
| 17.36.99 | OTHER WOODWORKING OCCUPATIONS | | | | |
| NOT CODED | WOOD PATTERN, MODEL MAKING AND RELATED OCCUPATIONS | (5)4-24:1 | PATTERNMAKING | V | 208 |
| 17.99 | OTHER TRADES AND INDUSTRIAL OCCUPATIONS | | | | |
| NOT CODED | INDUSTRIAL MACHINERY AND EQUIPMENT REPAIR OCCUPATIONS | (3)2-04:5 | LINOTYPE MAINTENANCE | V | 72 |
| | | (3)4-19:1 | INDUSTRIAL HYDRAULICS - PNEUMATICS | V | 183 |
| NOT CODED | QUALITY CONTROL INSPECTION OCCUPATIONS | (3)4-20:9 | MACHINED PARTS INSPECTION | V | 187 |

TABLE II. ADULT VOCATIONAL - APPRENTICE - ADULT HIGH SCHOOL DIVISIONS HANDBOOK

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1968-1970 EDITION PAGE # | CODE | TITLE |
| (3)1-01:1 | ACCOUNTING | 28 | 14.01.02 | Bookkeepers |
| (3)1-07:3 | Business Data Processing | 31 | 14.02.01 | Computer and Console Operators |
| (3)1-03:1 | Business Machines | 35 | 14.01.04 | Machine: Billing, Bookkeeping and Computi Machine Operator |
| (3)1-03:2 | Bookkeeping Machines | 35 | 14.01.04.99 | Machine: Billing, Bookkeeping and Computi Machine Operator (Specialization-Bookkee Machines) |
| (3)1-03:3 | Calculating Machines | 35 | 14.01.04.99 | Machine: Billing, Bookkeeping and Computi Machine Operator (Specialization-Calcula Machines) |
| (3)1-03:4 | Duplicating Machines | 36 | 14.03.01 | Duplicating Machine Operators |
| (3)1-03:5 | Transcribing Machines | 36 | 14.09.01 | Clerk-Typist |
| (3)1-04 | MARKETING | 41 | 04.01.14 | Marketing (General) |
| (3)1-04:1 | Retail Store Training | 41 | 04.01.17 | Retail Trade (General) |
| (3)1-04:2 | Cashier-Checker Training | 41 | 14.01.03 | Cashiers |
| (3)1-04:3 | Service Marketing | 41 | 04.01.99 | "Service Marketing" Under other Instructio Programs |
| (3)1-05 | RELATED BUSINESS | 46 | No corresponding major H.E.W. grouping. 14.03.03, General Offic Clerks is closest match. | |
| (3)1-05:1 | Financial Clerk | 46 | 04.01.04 | Finance and Credit |
| (3)1-05:2 | Receptionist | 46 | 14.04.06 | Receptionists and Information Clerks |
| (3)1-06 | SECRETARIAL SCIENCE | 51 | 14.07 | Stenographic, Secretarial and related Occupations |
| (3)1-06:1 | Secretarial | 51 | 14.07.02 | Secretaries |
| (3)1-06:2 | Office Clerical | 52 | 14.03.03 | Clerk, General Office |
| (3)1-06:3 | Stenographer Clerical | 52 | 14.07.03 | Stenographers |
| (3)2-03:1 | Photography: Dark Room Aide | 67 | 17.09.99 | Photographic Laboratory and Darkroom & Occupations |
| (3)2-04:1 | PRINTING AND PUBLISHING | 71 | 17.19 | Graphic Arts Occupations |
| (3)2-04:2 | Composition and Make up | 72 | 17.19* | Composition, make up and type setting Occupations under Graphic Arts (Applies t Compositor Occupations listed) |

*The H.E.W. did not break down Graphic Arts Occupations. When the Occupational Cluster Reference Guide was submitted, recommended breakdow were submitted to H.E.W. with occupations clustered by such breakdowns. It is possible that H.E.W. will utilize and code such breakdowns when this guide is published.

## APPENDIX J

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1968-1970 EDITION PAGE # | CODE | TITLE |
| (3)2-04:3 | Machine Typesetting | 72 | 17.19* | Composition, make up and Type Setting Occupations under Graphic Arts (Applies to Machine Typesetting Occupations listed) |
| (3)2-04:4 | Presswork | 72 | 17.19* | Printing Presswork Occupations under Graphic Arts |
| (3)2-04:5 | Linotype Maintenance | 72 | 17.99 | Industrial Machinery and Equipment Repair Occupations under other Trades and Industrial occupations. |
| (3)2-04:6 | Teletypesetter Perforator Operation | 72 | 14.09.02 | Key Punch and Coding Equipment Operators |
| (5)2-04 | PRINTING AND PUBLISHING-APPRENTICESHIP PROGRAMS | 73 | 17.19 | Graphic Arts Occupations |
| (5)2-04:1 | Compositor Apprentice Program | 73 | 17.19* | Composition, make up and typesetting occupations under Graphic Arts |
| (5)2-04 | Lithographic Offset Apprentice Program | 73 | 17.19* | Lithographic, Photographic and Platemaking Occupations under Graphic Arts |
| (5)2-04:3 | Lithographic Proofer | 73 | 17.19* | Lithographic, Photographic and Platemaking Occupations under Graphic Arts |
| (5)2-04:4 | Lithographic Cameraman | 74 | 17.19* | Lithographic, Photographic and Platemaking Occupations under Graphic Arts |
| (5)2-04:5 | Lithographic Stripper | 74 | 17.19* | Lithographic, Photographic and Platemaking Occupations under Graphic Arts |
| (5)2-04:6 | Lithographic Platemaker | 74 | 17.19* | Lithographic, Photographic and Platemaking Occupations under Graphic Arts |
| (5)2-04:7 | Lithographic Artist | 74 | 17.19* | Lithographic, Photographic and Platemaking Occupations under Grapic Arts |
| (5)2-04:8 | Lithographic Offset Pressman | 74 | 17.19* | Primarily a Specialization of Printing Presswork Occupations under Graphic Arts |
| (3)-05:2 | Child Day Care Assistant Training | 97 | 09.02.01 | Care and Guidance of Children |
| (3)3-04 | HOME MANAGEMENT AND FURNISHINGS | 103 | 09.02 | Home Economics, Occupational Preparation |
| (3)3-04:1 | Home Management Aide | 103 | 09.02.05 | Institutional and Home Management and Supporting Services. |
| (3)3-04:2 | Drapery Construction Specialist | 103 | 09.02.04 | Homefurnishings, Equipment and Service. |
| (3)4-01:1 | AIR CONDITIONING, REFRIGERATION AND HEATING | 116 | 17.01 | Air Conditioning |
| 4-02 | AIRCRAFT MECHANICS | 118 | 17.04.01 | Aircraft Maintenance |

*The H.E.W. did not brak down Graphic Arts Occupations. When the Occupational Cluster Reference Guide was submitted, recommended breakdowns were submitted to H.E.W. with occupations clustered by such breakdowns, it is possible that H.E.W. will utilize and code such breakdowns when this guide is published.

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1968-1970 EDITION PAGE # | CODE | TITLE |
| (3)4-02:2 | AIRFRAME MECHANIC | 119 | 17.04.01.01 | AIR FRAME |
| (3)4-02:3 | POWERPLANT MECHANIC | 119 | 17.04.01.02 | POWERPLANT AND AUXILLIARY SYSTEMS |
| (3)4-45:1 | APPLIANCE SERVICING | 126 | 17.02 | APPLIANCE REPAIR |
| (3)4-04:1 | AUTOMOBILE SERVICING | 130 | 17.03 | AUTOMOTIVE INDUSTRIES |
| NOT CODED | AUTOMOBILE ELECTRICAL SYSTEMS | 130 | 17.03.03 | SPECIALIZATIONS |
| NOT CODED | AUTOMOBILE ENGINES | 130 | 17.03.03 | SPECIALIZATIONS |
| NOT CODED | AUTOMOBILE FRONT END & BRAKES | 130 | 17.03.03 | SPECIALIZATIONS |
| NOT CODED | AUTOMOBILE TRANSMISSIONS & DRIVELINES | 131 | 17.03.03 | SPECIALIZATIONS. |
| (3)4-04:2 | AUTOMOBILE BODY SERVICING | 131 | 17.03.01 | BODY AND FENDER |
| (3)4-04:8 | AUTOMOBILE SERVICING-MECHANICAL ELECTRICAL (EVENING CERTIFICATE PROGRAM) | 131 | 17.03.02 | MECHANICS |
| (3)4-04:9 | AUTO BODY REPAIRING (EVENING CERTIFICATE PROGRAM) | 131 | 17.03.01 | BODY AND FENDER |
| (3)4-04:A | SMALL ENGINE AND OUTBOARD MOTOR REPAIR (EVENING CERTIFICATE PROGRAM) | 131 | 17.31 | SMALL ENGINE REPAIR |
| | AUTOMOBILE SERVICING - APPRENTICE PROGRAM | 131 | 17.03 | AUTOMOTIVE INDUSTRIES |
| (5)4-04:1 | AUTOMOTIVE MECHANIC | 131 | 17.03.02 | MECHANICS |
| (5)4-04:2 | AUTOMOBILE BODY REPAIRMAN | 132 | 17.03.01 | BODY AND FENDER |
| 4-05 | BAKING | 140 | 17.29.01 | BAKER |
| (3)4-05:1 | BAKER (DIPLOMA PROGRAM) | 140 | 17.29.01 | BAKER |
| (5)4-05:1 | BAKER (APPRENTICE PROGRAM) | 140 | 17.29.01 | BAKER |

APPENDIX J

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1968-1970 EDITION PAGE # | CODE | TITLE |
| 4-08 | Bricklaying and Masonry | 143 | 17.10.04 | Masonry |
| (3)4-08:1 | Diploma Program | 143 | 17.10.04 | Masonry |
| (3)4-08:2 | Certificate Program | 144 | 17.10.04 | Masonry |
| (5)4-08:1 | Bricklayer and Mason - Apprentice Program | 144 | 17.10.04 | Masonry |
| (5)4-08:2 | Cement Mason - Apprentice Program | 144 | 17.10.99 | Cement and Concrete Finishing under other Construction and Maintenance Trades |
| 4-09 | Cabinetmaking & Millwork | 149 | 17.36.01 | Millwork and Cabinetmaking |
| (3)4-09:1 | Diploma Program | 149 | 17.36.01 | Millwork and Cabinetmaking |
| (3)4-09:2 | Certificate Program | 150 | 17.36.01 | Millwork and Cabinetmaking |
| (3)4-10 | Carpentry | 152 | 17.10.01 | Carpentry |
| (3)4-10:1 | Diploma Program | 152 | 17.10.01 | Carpentry |
| (3)4-10:2 | Certificate Program | 152 | 17.10.01 | Carpentry |
| (5)4-10:1 | Apprentice Program | 153 | 17.10.01 | Carpentry |
| (5)4-11:1 | Carpet and Resilient Tile Layer | 158 | 17.10.99 | Linoleum, Resiliant Tile and Carpet Layers under Other Construction and Maintenance Trades. |
| (3)4-12:1 | Combustion Engines | 160 | 17.12* | Diesel Mechanic |

*The MTC and HEW are not perfect matches. H.E.W. divides the subject material covered between 17.12 Diesel Mechanics, 17.10.03.01 Maintenance, Heavy Construction Equipment, and some occupations under 17.03.02 Automotive Mechanics.

| | | | | |
|---|---|---|---|---|
| 4-13 | Electricity | 163 | - | - |
| (3)4-13:1 | Diploma Program | 163 | 17.14.01 | Industrial Electrician |
| (5)4-13:1 | Apprentice Program | 164 | 17.10.02 | Electricity |
| 4-14:1 | Electronics, Radio, and Television | 170 | 17.15 | Electronics Occupations |

| COURSE NUMBER | COURSE TITLE | 1968-1970 EDITION PAGE # | CODE | TITLE |
|---|---|---|---|---|
| 4-15 | Foundry | 177 | 17.23.01 | Foundry and Related Occupations |
| (3)4-15:3 | Machine Molder & Coremaker | 177 | 17.23.01 | Machine Molding and Coremaking Occupations under Foundry and Related Occupations |
| (3)4-15:4 | Loose Molder | 177 | 17.23.01 | Bench, Floor, and Pit Molding Occupations under Foundry and Related Occupations |
| (5)4-15:1 | Foundry | 177 | 17.23.01 | Foundry and Related Occupations |
| (5)4-17:1 | Glazing (Apprentice) | 181 | 17.10.99 | Glazing under Other Construction and Maintenance Trades |
| (3)4-19:1 | Industrial Hydraulics-Pneumatics | 183 | 17.99* | A specialization of Industrial Machinery an Equipment Maintenance and Repair Occupati under Other Trades and Industrial Occupat |
| (3)4-20 | Machine Shop | 186 | - | - |
| (3)4-20:1 | Machine Shop (Diploma Program) | 186 | 17.23.02 | Machine Shop |
| (3)4-20:2 | Engine Lathe Operation (Certificate Program) | 187 | 17.23.03 | Machine Tool Operation (Engine Lathe Occupations listed) |
| (3)4-20:3 | Milling Machine Operation (Certificate Program) | 187 | 17.23.03 | Machine Tool Occupations (Milling Machines Occupations listed) |
| (3)4-20:4 | Turret Lathe Opr. (certificate Program) | 187 | 17.23.03 | Machine Tool Occupations (Turret Lathe Occupations listed) |
| (3)4-20:5 | Automatic Screw Machine Opr. (Certificate Program) | 187 | 17.23.03 | Machine Tool Occupations (Automatic Screw Machine Occupations) |

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*Primary occupational application. This course has other occupational applications, such as 17.10.03.01 Maintenance, Heavy Construction Equipment.

MILWAUKEE TECHNICAL COLLEGE | HEW INSTRUCTIONAL PROGRAM

| COURSE NUMBER | COURSE TITLE | 1968-1970 EDITION PAGE # | CODE | TITLE |
|---|---|---|---|---|
| (3)4-20:9 | Machined Parts Inspection (Certificate Program) | 187 | 17.99* | Other Trades and Industrial Occupations |
| (5)4-20:1 | Machine Shop (Apprentice Program) | 188 | 17.23.02 | Machine Shop |
| 4-21 | Mechanical Drafting | 197 | 17.13 | Drafting Occupations (Mechanical Drafting Occupations listed) |
| (3)4-21:1 | Mechanical Drafting (Diploma Program) | 197 | 17.13 | Drafting Occupations |
| (5)4-21:1 | Mechanical Drafting (Apprentice Program) | 198 | 17.13 | Drafting Occupations (all) |
| 4-22 | Metallurgy | 202 | | |
| (3)4-22:1 | Metallurgy (Certificate Program) | 202 | 17.23.99 | Heat Treating under Other Metalworking Occupations |
| (5)4-22:1 | Metallurgy (Apprentice Program) | 202 | 17.24 | Metallurgy Occupations |
| (5)4-24:1 | Painting and Decorating | 205 | 17.10.05 | Painting and Decorating |
| (5)4-24:1 | Patternmaking | 208 | 17.36.99 | Wood Pattern, Modelmaking and Related Occupations under Other Woodworking Occupations |
| (5)4-27:1 | Plumber | 211 | 17.10.07 | Plumbing and Pipe Fitting |
| 4-32 | Sheet Metal | 219 | - | - |
| (3)4-32:1 | Sheet Metal (Diploma Program) | 219 | 17.23.05 | Sheet Metal |
| (3)4-32:2 | Sheet Metal (Certificate Program) | 219 | 17.23.05 | Sheet Metal |

*No provision for Specialized Inspection in H.E.W. This can be coded under 17.99. This instructional program has a much wider application for occupational preparation than inspection of Machined Metal Products.

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1968-1970 EDITION PAGE # | CODE | TITLE |
| (5)4-32:1 | Sheet Metal Worker (Apprentice Program) | 219 | 17.10.99 | Sheet Metal Construction, Installation and Repair under Other Construction and Maintenance Trades. |
| 4-33 | Shoe Servicing | 227 | 17.34 | Shoe Manufacturing and Repair |
| (3)4-33:1 | Shoe Servicing (Diploma Program | 227 | 17.34 | Shoe Manufacturing and Repair |
| (3)4-33:2 | Shoe Servicing (Certificate Program) | 227 | 17.34 | Shoe Manufacturing and Repair |
| (5)4-34:1 | Sprinkler Fitting (Apprentice) | 230 | 17.10.07 | Sprinkler Fitting under Plumbing and Pipe Fitting. |
| (5)4-35:1 | Steamfitter (Apprentice) | 232 | 17.10.07 | Steamfitting under Plumbing and pipe Fitti |
| (5)4-37:1 | Structural Steel and Ironwork (Apprentice) | 235 | 17.10.99 | Structural Steel and Ornamental Iron Erecti and Installation under Other Constructio and Maintenance Trades |
| 4-38 | Tailoring | 238 | 17.33 | Textile Production and Fabrication |
| (3)4-38:1 | Tailoring (Diploma) | 238 | 17.33.02 | Tailoring |
| (3)4-38:2 | Bushelman (Diploma) | 239 | 17.33:02 | Tailoring (All occupations except Master T |
| (3)4-38:3 | Alteration Woman (certificate) | 239 | 17.33.01 | Dressmaking |
| 4-39 | Tool and Die Making | 243 | 17.23.02 | Tool, Die, and Metal Patternmakers and Rel Occupations under Machine Shop |
| (3)4-39:1 | Tool and Die Making (Diploma Program) | 243 | 17.23.02 | Tool, Die, and Metal Patternmakers and Rel Occupations under Machine Shop |
| (5)4-39:1 | Tool and Die Making (Apprentice Program) | 244 | 17.23.02 | Tool, Die, and Metal Patternmakers and Rel Occupations under Machine Shop |
| 4-40 | Upholstery | | 17.35 | Upholstering |

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1968-1970 EDITION PAGE # | CODE | TITLE |
| (3)4-40:1 | Upholstery (Diploma Program) | 248 | 17.35 | Upholstering |
| (3)4-40:2 | Upholstery (Certificate Program) | 249 | 17.35 | Upholstering |
| 4-41 | Watch and Allied Instrument Repair (Diploma Program) | 251 | 17.21.02 | Watchmaking and Repair |
| (3)4-41:1 | Watch and Allied Instrument Repair (Apprentice Program) | 251 | 17.21.02 | Watchmaking and Repair |
| (5)4-41:1 | Watch and Allied Instrument Repair | 252 | 17.21.02 | Watchmaking and Repair |
| 4-42 | Welding | 255 | 17.23.06 | Welding |
| (3)4-42:6 | Welding, Gas-Arc (Diploma Program) | 255 | 17.23.06 | Welding (Combination Arc & Gas Welding Occupations listed) |
| (3)4-42:7 | Welding, Gas (Certificate Program) | 255 | 17.23.06 | Welding ( Gas Welding Occupations listed) |
| (3)4-42:8 | Welder, Arc (Certificate Program) | 256 | 17.23.06 | Welding (Arc Welding Occupations listed) |
| (5)4-42:1 | Welding (Apprentice Program) | 256 | 17.23.06 | Welding (All welding and Flame Cutting Occupations listed) |
| 5-01 | Barber | | 17.26.01 | Barbering |
| (3)5-01:1 | Barbering (Diploma) Plus: | 256 | 17.26.01 | Barbering |
| (5)5-01:1 | Barber (324 hour apprentice) | 257 | 17.26.01 | Barbering |
| (5)5-01:2 | Barber (864 hour Apprentice) | 257 | 17.26.01 | Barbering |
| 5-02 | Cosmetology | 278 | 17.26.02 | Cosmetology |
| (3)5-02:1 | Cosmetology (Diploma) | 278 | 17.26.02 | Cosmetology |

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1968-1970 EDITION PAGE # | CODE | TITLE |
| (5)5-02:1 | Cosmetology (Apprentice) | 279 | 17.26.02 | Cosmetology |
| 5-18 | Food Service | 284 | 17.29.02 | Cook/Chef |
| (3)5-18:1 | Short Order Cook (Diploma) | 284 | 17.29.02 | Cook/Chef (entry and helper Occupations) |
| (3)5-18:3 | Counterman (certificate) | 285 | 17.29.02 | Cook/Chef (Entry and Helper Occupations) |

## TABLE III. MILWAUKEE TECHNICAL COLLEGE

### Instructional Programs As Compared To H.E.W. Instructional Program Outline

### TECHNICAL AND JUNIOR COLLEGE DIVISIONS HANDBOOK

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1967-1969 EDITION PAGE # | CODE | TITLE |
| (1)1-01:1 | Accounting | 28 | 14.01.01 | Accountant, Junior |
| (1)1-02:1 | Business Administration | 32 | 04.01 | Distributive Education Instructional Programs |
| (1)1-02:2 | General Business | 35 | 04.01 | Distributive Education Instructional Programs |
| (1)1-02:3 | Finance | 32 | 04.01.04 | Finance and Credit |
| (1)1-02:4 | Management | 33 | 04.01.13 | Management (General) |
| (1)1-02:5 | Real Estate | 34 | 04.01.16 | Real Estate |
| (1)1-07:1 | Business Data Processing | 41 | 14.02.03 | Programmers |
| (1)1-04:1 | Marketing | 44 | 04.01.14 | Marketing (General) |
| (1)1-04:2 | Marketing Administration | 44 | 04.01.14 | Marketing (General) |
| (1)1-04:3 | Retail Administration | 44 | 04.01.17 | Retail Trade (General) |
| (1)1-04:4 | Transportation and Traffic Management | 45 | 04.06.03 | Transportation |
| (1)1-06:1 | Secretarial Science | 51 | 14.07.02 | Secretaries |
| (1)1-06:2 | Secretarial | 51 | 14.07.02 | Secretaries |
| (1)1-06:3 | Legal Secretarial | 51 | 14.07.02.99 | Legal Secretarial |
| (1)2-01:1 | Commercial Art | 62 | 17.07 | Commercial Art |
| (1)2-03:1 | Photography | 66 | 17.09 | Commercial Photography |

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1967-1969 EDITION PAGE # | CODE | TITLE |
| (1)2-04:1 | Printing and Publishing | 72 | 17.19* | Graphic Arts, Technical and Managerial Occupations |
| (1)2-04:2 | Operations Major | 72 | 17.19* | Technical and Managerial Occupations under Graphic Arts (Applies to Technical occupati listed) |
| (1)2-04:3 | Administration Major | 72 | 17.19* | Technical and Managerial Occupations under Graphic Arts (Applies to Managerial Occupations listed) |
| (1)5-03:1 | Fire Technology | 80 | 17.28.01 | Fireman Training |
| (1)5-04:1 | Police Science Technology | 83 | 17.28.02 | Law Enforcement Training |
| (1)5-11:1 | Restaurant and Hotel Cookery | 87 | 17.29 | Quantity Food Occupations |
| (1)5-11:2 | Commercial Food Preparation | 87 | 17.29.02 | Cook/Chef |
| (1)5-11:3 | Pastry Chef | 88 | 17.29.01 | Baker |
| (1)5-08:1 | Dental Assistant | 97 | 07.01.01 | Dental Assistant |
| (1)5-07:1 | Dental Laboratory Technology | 100 | 07.01.03 | Dental Laboratory Technician |
| (1)5-09:1 | Medical Assistant | 104 | 07.02 | Medical Services |
| (1)5-10 | Nursing | 106 | Not Coded | Nursing |
| (1)5-10:1 | Practical Nursing (Affiliated Hospital Schools) | 107 | 07.02.06 | Practical (Vocational) Nurse |
| (1)5-10:2 | Professional Nursing | 109 | 07.02.04 | Nurse |
| (1)5-10:3 | Professional Nursing (Assoc. Degree) | 108 | 07.02.04 | Nurse |

APPENDIX J

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1967-1969 EDITION PAGE # | CODE | TITLE |
| (1)6-01:1 | Air Conditioning and Refrigeration Technology | 121 | 16.01.10 | Environmental Control Engineering Technology |
| (1)6-14:1 | Architectural Technology | 124 | 16.01.03 | Architectural Engineering Technology |
| (1)6-02:1 | Automotive Technology | 127 | 16.01.04 | Automotive Engineering Technology |
| | (The above two are not exactly comparable. The H.E.W. course is primarily oriented to Production Engineering; the M.T.C. course to Maintenance at Tech. level) | | | |
| (1)6-03:1 | Chemical Technology | 130 | 16.01.05 | Chemical Engineering Technology |
| (1)6-15 | Civil Technology | 132 | 16.01.06 | Civil Engineering Technology |
| (1)6-15:1 | Structural | 132 | 16.01.06.03 | Structural Technology |
| (1)6-15:2 | Highway | 133 | 16.01.06.01 | Roadway Technology |
| (1)6-04:1 | Diesel Technology | 138 | 16.01.13.01 | Energy Conversion |
| (1)6-05:1 | Electrical Technology | 142 | 16.01.07 | Electrical Engineering Technology |
| (1)6-05:2 | Communications Major | 142 | 16.01.08.99 | No classified program - primarily covered by electronics. |
| (1)6-05:3 | Electronics Major | 143 | 16.01.08 | Electronics Engineering Technology |
| (1)6-05:4 | Instrumentation Major | 143 | 16.01.12 | Instrumentation Engineer Technology |
| (1)6-05:5 | Computers | 144 | 16.01.17 | Scientific Data Processing |
| (1)6-12:1 | Fluid Power Technology | 152 | 16.01.13.99 | No classified program - primarily covered by Mechanical Technology |

APPENDIX J

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| COURSE NUMBER | COURSE TITLE | 1967-1969 EDITION PAGE # | CODE | TITLE |
| (1)6-06:1 | Mechanical Technology | 155 | 16.01.13 | Mechanical Engineering Technology |
| (1)6-06:2 | Design Major | 155 | 16.01.13.02 | Machine and Tool Design |
| (1)6-06:3 | Manufacturing Major | 155 | 16.01.13.03 | Production |
| (1)6-13:1 | Metallurgical Technology | 162 | 16.01.14 | Metallurgical Engineering Technology |
| (1)6-16:1 | Photo Instrumentation Technology | 165 | 16.01.99 | No classified program. This is a combination of Photography, Electronics Instrumentation and optics. |
| (1)6-08:1 | Technical Engineering | 167 | 16.01 | Engineering Related Technology |
| (1)6-08:2 | Electrical Major | 168 | 16.01.07 | Electrical Engineering Technology |
| (1)6-08:3 | Industrial Major | 169 | 16.01.11 | Industrial Engineering Technology |
| (1)6-08:4 | Mechanical Major | 168 | 16.01.13 | Mechanical Engineering Technology |
| (1)6-08:5 | Tooling Major | 170 | 16.01.13.02 | Machine and Tool Design |
| (1)7-01:1 | Telecasting | 183 | 04.10.99 | No Classified Program |
| (1)8-01 | Junior College Division | 187-216 | No specific occupational relationships; therefore these courses do not appear in the occupational cluster Reference Guide. | |

## TABLE IV. MILWAUKEE TECHNICAL COLLEGE SUBJECT MATTER

AREAS NOT RELATED TO APPRENTICESHIP
DIPLOMA NOR CERTIFICATE PROGRAMS

| MILWAUKEE TECHNICAL COLLEGE | | | HEW INSTRUCTIONAL PROGRAM | |
|---|---|---|---|---|
| CURRICULAR # | TITLE | 1968-70 EDITION PAGE # | CODE | TITLE |
| 1-08 | MANAGEMENT DEVELOPMENT | 39 | 17.17 | FOREMANSHIP, MANAGEMENT & SUPERVISION DEVELOPMENT |
| 2-01 | COMMERCIAL ART | 61 | SEE (1)2-01 | JUNIOR & TECHNICAL COLLEGE DIVISIONS |
| 2-02 | CRAFTS | 64 | | NO OCCUPATIONAL RELATIONSHIPS |
| 3-01 | CLOTHING | 91 | 09.01.03 | CLOTHING & TEXTILES (NO OCCUPATIONAL RELATIONSHIPS) |
| 3-02 | FAMILY HEALTH | 95 | 09.01.05 | FAMILY HEALTH (NO OCCUPATIONAL RELATIONSHIPS) |
| 3-03 | FOODS | 100 | 09.01.07 | FOODS & NUTRITION (NO OCCUPATIONAL RELATIONSHIPS) |
| 3-06 | RELATED ARTS | 106 | NO OCCUPATIONAL RELATIONSHIPS INTENDED, BUT SOME COURSES RELATE TO CERTAIN OCCUPATIONS LISTED UNDER INTERIOR DECORATING, DISPLAY DESIGNING AND LAY-OUT AND RELATED OCCUPATIONS, UNDER COMMERCIAL ART 17.07. | |
| 4-03 | ARCHITECTURAL DRAFTING | 128 | 17.13 | DRAFTING OCCUPATIONS (ARCHTECTURAL DRAFTING OCCUPATIONS LISTED) |
| 4-28 | POWER PLANT ENGINEERING | 215 | 17.32 | STATIONARY ENERGY SOURCES OCCUPATIONS |
| 4-29 | POWER SEWING | 217 | 17.33.99.02.02 | POWER SEWING OCCUPATIONS |
| 4-31 | SCHOOL FOR WORKERS | 261 | | NO OCCUPATIONAL RELATIONSHIPS |
| 5-10 | NURSING | 289 | 07.02.05 | NURSE'S AIDE |
| 8 | GENERAL EDUCATION DIV. | 293-321 | | NO OCCUPATIONAL RELATIONSHIPS |